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March 1991
47380

Radio Control CAR ACTION

THE WORLD'S PREMIER R/C CAR MAGAZINE

NEW

FOR

'91

First Look:
TAMIYA BULLHEAD

STUTTGART KYOSHO PORSCHE

STOMPER!

CAT ATTACK!

- Schumacher COUGAR
- Project LYNX

RC10 HYPERDRIVE

HEINOUS HYDRO!

MRP MISS BUDWEISER

Kyosho 1/8 Worlds Challenge

Quadmania!

4WD RC10

USA $3.50 CANADA $3.95

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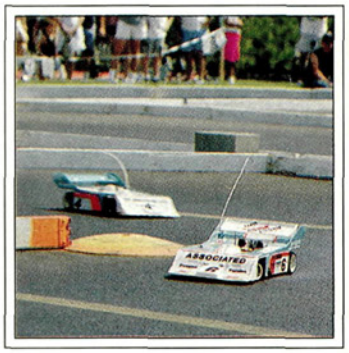

ON THE COVER: center—ROAR 1/8-scale Nats (photo by Jim Shepka). Upper Right—Modifed Motors; how to tune 'em up! (photo by Steve Pond). Upper left—Team Losi's new JRX-Pro (photo by Steve Pond). Middle—Kalt's new electric R/C helicopter. Lower right—Kyosho's new Outlaw Ultima racing truck (photo by Yamil Sued)

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EDITORIAL

by STEVE POND

THE ROAR elections are over and Roy Weast is now president.

We, at *Car Action,* avoided publishing any of the details of the events that led up to this election because we considered it to be the most counter-productive campaign in the history of the organization. Now that it's all over, however, I'll voice some legitimate concerns.

During the campaign, little constructive information was given about what each of the candidates would do for the organization. Instead, innuendoes, half-truths and speculative, derogatory accusations went flying from coast to coast. Roy Weast, or at least his manufacturer-affiliated supporter, was responsible for the lion's share of these "toilet-paper tactics." Their methods aren't only questionable, but they're also unethical. Dirty politics has no place in our great sport.

R/C racers aren't the sandlot group they were 20 years ago. The hobby is now massive, and if it's to keep growing, we need the support of a governing body that has the best interests of the *entire* sport in mind.

I've always stressed that candidates for the presidency of an organization like ROAR shouldn't be manufacturers, or have ties to any manufacturer. Too many decisions are made (e.g., those concerning approval of a product) that will ultimately affect the bottom line of their companies. In our industry, manufacturers' input is vital—they're the most knowledgeable on product-related subjects—but the buck should never stop there! Even with the best of intentions, in one way or another, concern for their companies instead of for consumers will play a role in their decision-making. That's what's called a conflict of interest.

I only hope that Roy Weast will be able to put his and others' business interests aside to make decisions that are best for the *entire* R/C racing community. This will ensure the growth of our sport for years to come.

The water is under the bridge, as they say, and Roy Weast is on his way to becoming ROAR president, but what exactly will his agenda be? Which motors will be used in the stock class? Are there any plans for new classes to accommodate enthusiasts at the local level? Will there be tighter restrictions concerning cars and motors in the stock class, etc.? These are the real issues that should have been addressed, and I invite Roy Weast to respond.

The type of racing that ROAR represents accounts for only a small percentage of the sport, as shown by the number of its members (compared with the number of subscribers to *Car Action* alone). If the serious racing segment of the hobby is to continue to grow and attract new blood, there must be equity and common sense in the decision-making process. I hope that the new administration will strive toward this goal. ■

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ON JUNE 26, 1990, APPLICATION FOR ABC (AUDIT BUREAU OF CIRCULATION) MEMBERSHIP WAS FILED BY R/C CAR ACTION.

LETTERS

We welcome your comments and suggestions. Letters should be addressed to "Letters," *Radio Control Car Action*, 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

"SKUNK" DON'T MEAN "JUNK"!

Chris, you need to be corrected! I'm a serious dirt-oval racer, and I don't think that Bolink cars are from the "on-road skunkworks." I have two Bolinks: one is set up for the modified class and the other for the late-model. They both work well and handle smoothly. Those who think the Bolink Invader is a piece of junk should come and watch me turn a few laps. You might be surprised! For what it's worth, I use various motors. I like the Twister Oval and Trinity's Magic Johnson coupled with an 8:53 pinion/spur gear. It requires a lot of patience and adjusting, but I have a ball!

Does every racer call a car "junk" just because it doesn't handle the way he wants it to? Hey, guys! After a car has been assembled, the real work begins!

MIKE HUDSON
Millsboro, DE

All right, Mike, class is now in session! Listen up, 'cause I'm only going to say this once! The term "skunkworks" is a compliment, not a put-down. The expression originated during WW I, and it referred to German U-boat manufacturing sites. These submarine research and development meccas were known for their creative ingenuity and on-location, top-secret, development programs. Today, this is a slang term that refers to manufacturing companies that are on the leading edge in their field. Be prepared for a pop quiz, Mike. No, wait—better yet! Go to the blackboard, and write "I'll never again question Chianelli's incredible brilliance and infinitely benevolent wisdom," 500 times! CC

FX-10 FRONT-SUSPENSION FIX

Recently, I bought a Futaba, FX-10, off-road, car kit. I have to give Futaba credit for creating a great car, but it's very hard to find hop-up parts for it. So far, the only thing I've found is a bearing set. Please

give me some manufacturers' names and addresses.

RYAN J. LANE
Garden City, AL

Ryan, CRP has a new front-end conversion kit for the Futaba FX-10. It vastly improves geometry throughout suspension travel by allowing the car to use lower A-arms with upper links. The kit includes aluminum, oil-filled coil-overs, all-nylon parts and, with minor modifications to their ABS bodies, it works on the Tamiya Sonic Fighter and the Striker. This new front end greatly improves the handling of these cars. CRP's address is 3250 El Camino Real B-3, Atascadero, CA 93422. CC

HOPPED HOPPER

I have a Grasshopper II, and I want to buy another motor for it. I was thinking of the Speedworks 350 or the Pole Position. Does it matter how good an electronic speed controller is? Which company makes the truck conversion for the Grasshopper II? Can I get a set of monster-truck rims for the back of my car? Are you going to do a report on the Hobby Show in Illinois?

MICHAEL McNICHOLS
Springdale, AR

Michael, because the Grasshopper II's diff wasn't designed for modified motors, I'd stick with a stock wind. Any electronic speed controller, even an "econo" version, will vastly improve a car's performance and simplify its internal wiring. Parma makes a truck conversion for the Hornet that fits the Grasshopper II, and it includes the monster wheels and tires.

Next month, we'll publish an article called, "New for '91," which is based on what we saw at the Chicago show. CC

DIFFERENT DIFF

I was told that if you dye nylon parts, they become stronger owing to the heating process. Then I read in your October issue (page 23), "Don't dye diff halves, chassis, or high-stress parts because it will

(Continued on page 18)

PUBLISHER'S PAGE

by LOUIS DeFRANCESCO

At the Chicago Model and Hobby Show, Team Losi—or rather, "clan" Losi—receive the coveted "1990 Car of the Year" trophy for the JR-X2. From left to right: "Pops" Losi, "Mom" Losi, Gil Losi Jr., Publisher Louis DeFrancesco, "Jumpin' Jack" Johnson (in rear), Chris "Lizard" Chianelli and Gary Kyes—all masquerading as dignitaries!

I've said this before, but I'll say it again: the R/C industry is going through a rapid evolution—a state of flux, if you will. For some, sales have softened, but for others, sales seem to be increasing at accelerating rates. Progressive manufacturers whose product lines remain contemporary will fare quite well in upcoming years.

New R/Cers have been weaned on electric power, and I see many making the transition to boats, motor gliders, airplanes and even helicopters, but for the most part, these are electric-powered. I think that newcomers' familiarity with Ni-Cd batteries and electric motors leads them toward these electric R/C interests. Restrictions on noise and space, and the cost of support equipment might also be responsible for steering new enthusiasts away from the glow engine. "Grim prognostications for the glow engine," you say?—not really. I'm sure there will always be a strong fraternity of modelers whose power of choice will be glow, but I see a whole new generation of electric R/Cers emerging.

And speaking of electric R/C, I've just returned from the Chicago Model & Hobby Show at the O'Hare Expo Center, and I can report that the industry is alive and well—as shown by the veritable plethora of new goodies being introduced by manufacturers.

Beginning on Friday night, the deluge of R/Cers who attended revived many spirits and was a positive indication of the industry's health. At these shows, our Air Age booth is always "bombarded," and this show was no exception—we were literally inundated with readers' positive comments.

This enthusiasm tells us we've been doing our job—informing and entertaining. For me, this is what makes my job so rewarding; but it's you—the R/Cer—who makes it all happen. R/Cers, this one's for you! ■

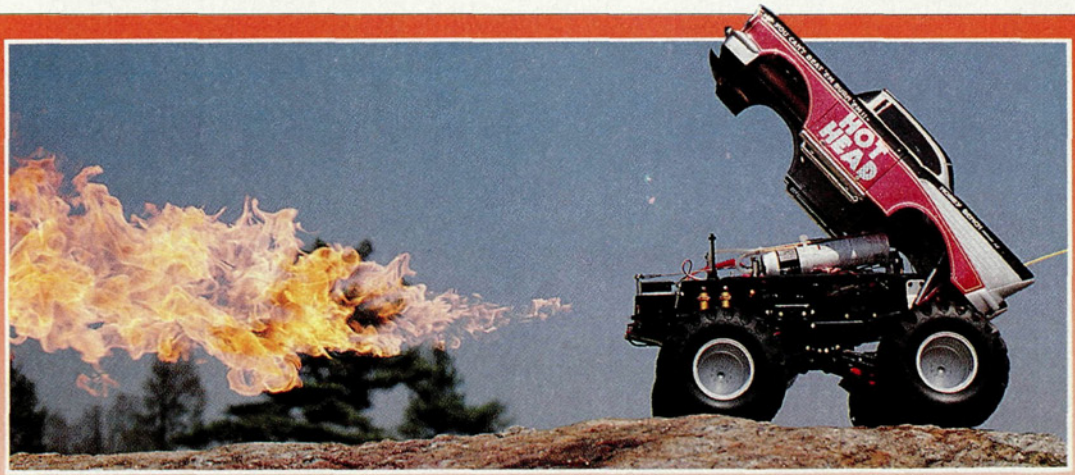
INSIDE SCOOP

by CHRIS CHIANELLI

As directed by the Ayatollah of Radio Controlla, Commander Crash Chianelli reporting back to the faithful followers of the Grand High Exalted with pertinent information! I'm back from my latest espionage excursion with microfilm, spy shots and stolen communiques that read as follows:

SHOW-STOPPING JUNIOR TWO

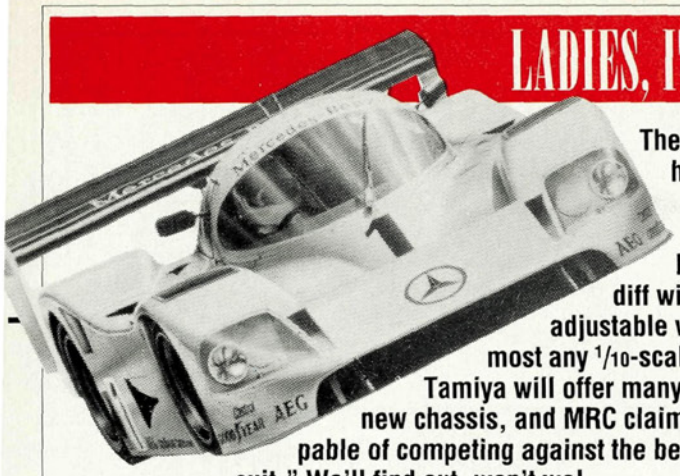
At the Chicago Model Hobby Show, there were a lot of new products to get worked up about, but I think the highlight was the Team Losi Junior Two. This new, budget-priced spin-off from the JR-X2 has shielded, steel, ball bearings, JR-X2-type metal shocks and an H-arm rear suspension, but the real kicker is its new "matrix fiber/resin composite" chassis. Don't ask me what that means; I don't know, and Losi won't tell me—a wise decision! Anyway, the chassis is thinly molded with ridges for excellent stiffness, and it turned out so well that some of the Team's racers have switched from the graphite chassis. But wait!—here's the best part: don't be surprised if you see the car for as little as $119 after discounts! Give us more!!



This spy shot of the new turbine-powered monster-truck crusher was taken with a 10,000mm telescopic lens. Here, for the first time, the R&D team tests the prototype 1/10-scale jet engine in the afterburner mode. Our agent in the Midwest reports that, by all indications, the project is a success. If so, electric motors will be outclassed forever in monster crushing and drag racing!

1/10-SCALE JET POWER TO COME?

LADIES, IT'S A MERCEDES!



The front and rear ride heights on the all-new, 1/10-scale Tamiya C11 are adjustable. It also has a limited-slip ball diff with safety clutch and an adjustable wheelbase that fits almost any 1/10-scale body. It's reported that Tamiya will offer many of its own bodies for the new chassis, and MRC claims, "This machine is capable of competing against the best 2WD cars on the circuit." We'll find out, won't we!

AYK AMERICA

Race Prep announces the closing of AYK of Japan. Race Prep has purchased all inventory as well as some key tooling equipment, and it will continue to produce the Pro Radiant and other AYK products. Mr. Aoyagi, the president of AYK Racing of Japan, is ill and has been hospitalized for the past year. We wish the Aoyagi family well.

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COUGAR'S GOT A TAIL ...GATE

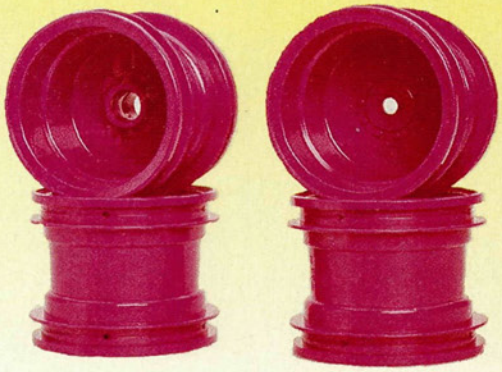
Schumacher has entered the off-road-truck-racing game with the Shotgun—a 2WD truck that's based on the Cougar. Its first time out, the new truck took 1st and 2nd in Stock and 2nd and 3rd in Modified at the Florida State Off-Road Truck Championships. It also broke the track record at Lake Park in Lutz, FL—by a full lap!

MRP SUPERBOAT

MRP's super-sleek, 41 1/2-inch version of Fountain Power's world-record-holding, 45-foot Superboat is beautiful to watch in action. Although I only saw it run in the short boat pond at the Chicago Hobby Show, this electric, offshore, ocean racer showed good speed and great rough-water capabilities. The company claims that, with the optional MRP microswitch and two 6-cell packs, the Superboat can reach 20mph. Add the performance package, which includes two Wizard MS-2 motors and the same transmission as the Unlimited Budweiser, and it boasts even greater speeds. Equip it with two water-cooled Trinity Modified Marine motors, and you'd better watch out!

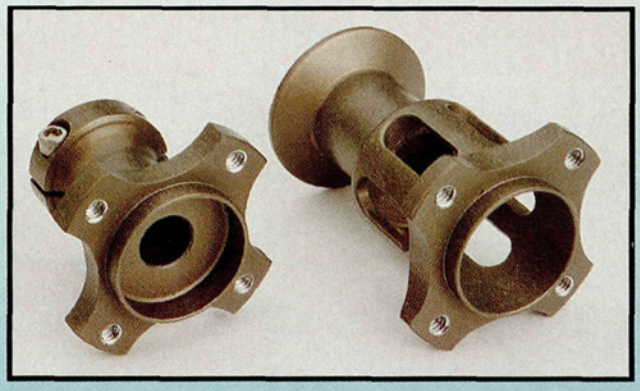
KING/HI COLOR

Day-Glo wheels in hot pink, lime green and fuchsia are now available for the competition-worthy King Cab and Hi-Lux, and they cost the same as the standards wheels. JUST IN! My beautiful spy in the East (code-name: High Lingafoon Lady) has informed me that she spotted a pink-chrome set of these wheels on a King Cab at the Tamiya test track. Furthermore, her secret source revealed that experiments are being done with chrome silver, gold and metallic blue. Production intentions, however, are still unclear.



MASTER OF 4 MOTORS

According to its manufacturer, PDI's new Zeta Xtra is "the most rugged, powerful speed controller on the market today!" PDI may be able to back up these words with some serious specs. This programmable unit handles up to 36 cells and 315 amps continuous, with a 1200A surge capability—all with an internal resistance of .0026 ohm! Intended for multiple modified motors, the Xtra is already being used with four motors at truck pulls.



ULTRA HUBS

MK Engineering will introduce precision-machined hubs that are made of 7075 aluminum and are *truly* hard-anodized. This not only makes them substantially stronger, but also approximately 50 percent lighter than stock hubs. A slotted collar on the left hub enables you to tighten it on the axle, and this eliminates the need for grub screws and the problems associated with them. ULTRA Hubs will probably sell for approximately 50 bucks a set, and they'll be available for the Lynx II, the 10L and other standard pan-car axles. For further specs and a release time, write to MK Engineering, P.O. Box 216, Seymour, CT 06483.

Flames, splashes, waves, "seismics" and numbers are the first brightly colored shapes to come from the California-based Eagle Products. These decals are specially made *not* to bubble, as long as they're applied correctly. Graphic artist/designer Gino DiFillipi, of West Coast fame, is working on designs no one else has, and he'll let me know when final proofs are available. As well as being applied on the inside (no more scraped and scratched decals!), the Eagle Product appliqués are unaffected by the gas that's given off by polycarbonate bodies (a major cause of the formation of mini bubbles after decals have been applied). Stay tuned; there's more—much more!

FIRE UNDER THE SKIN

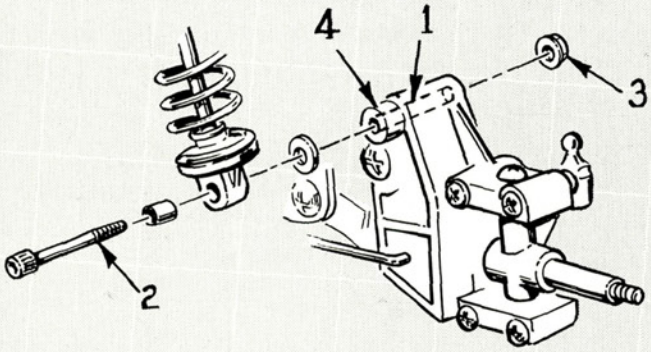
BAVARIAN MURDER MOTOR

The German-made, cobalt-samarium Plettenberg motors are said to be "killers" for pulling and drag racing. Although they're OK for Open II, there's some debate about their legality in other classes, but I'm sure everything will be worked out in a gentlemanly way! Hobby Lobby International (of Brentwood, TN) now imports these super-high-quality—and expensive—motors under the name of "Ultra," and we'll test them in our "Truck Stop" column soon.

I'll see you next time–or sooner, if I catch you in my spyglass! CC

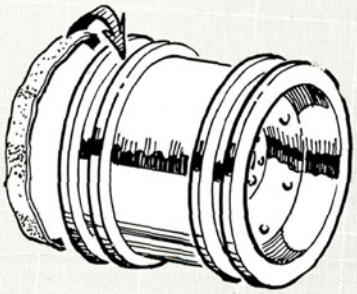
PIT TIPS

by JIM NEWMAN



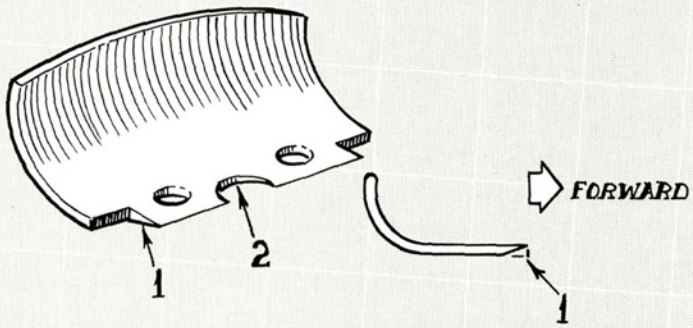
BLACKFOOT STEERING UPRIGHT IMPROVEMENT

The lower front right and left uprights tend to break because the short screw throws its entire load onto a small threaded stub. To spread the load, drill a hole (1) right through the stub and into the upright, insert a 3x12mm bolt (2), and secure this with a self-locking nut (3). Now there's less risk of damaging the stub (4). You can also use this tip on the Frog and the Monster Beetle. *Gary Sullivan, South River, NJ*



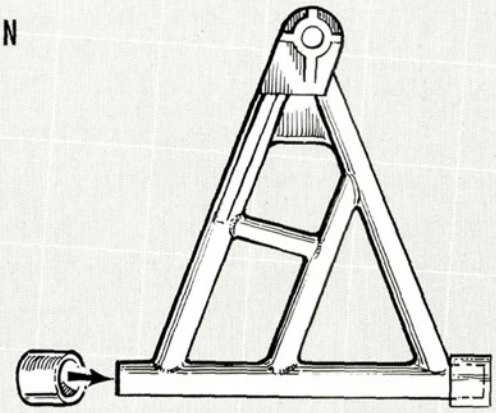
SPINNING RIMS

After buying chrome wheels for his Blackfoot, Tim discovered that its tires were spinning on the rims. To cure this, he removed the tires and stretched wide, flat, rubber bands around the recesses in the rims; then he put the tires back onto the wheels. The tires now stay put. *Tim Suggs, Stanley, NC*



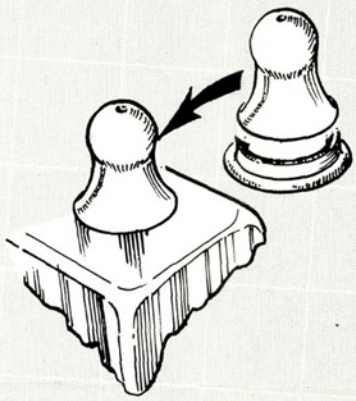
YZ-10 REAR BUMPER

Made from a JG Mfg. rear bumper, this protects the YZ-10's rear bulkhead and nearby parts from being damaged in a rear-ender. Use a file to bevel the edges marked 1 and 2. The bevels stop the bottom edge from being caught on rocks, and no. 2 also accommodates the protruding center screw. *Don Sieg, Whitewater, WI*



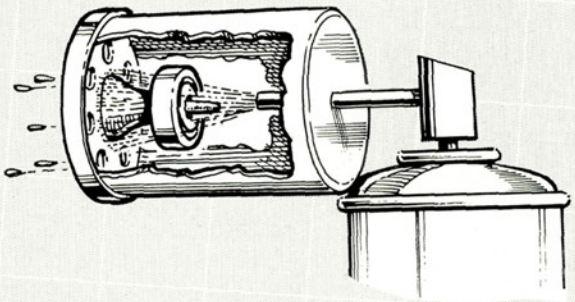
LUNCH BOX PIVOT WEAR

After many miles, owners often find that their car's A-frame pivots have worn considerably. Mark found that sleeves made of pieces of vinyl fish-tank hose work well to protect the A-frame bushings from wear. You could also use silicone fuel line from a hobby store. *Mark Tetreavit, Woodstock, CT*



EFFICIENT SELF PRIMER

Frank has installed a cut-down baby-bottle nipple on his gas cap, and he says it's a much more efficient primer than the original equipment. You must ensure that the hole in the nipple is large enough to allow an adequate gas flow to the engine. *Frank Cacioppo, Tickfaw, LA*



BEARING BLASTER

Glue a golf tee to the lid of a plastic 35mm-film container (hot glue would probably be best for this), then drill a series of drainage holes around the tee. In the bottom of the container, drill a hole to fit the tube of a motor-cleaner aerosol can tightly. Jam the bearing over the tee, and blast the dirt out of the bearing race with your favorite motor cleaner. *John Rigsby, Bethany, OK*

LETTERS *(Continued from page 9)*

weaken them." Which is true?

KEN GREEN
Las Vegas, NV

Ken, the "Radicator" article you refer to simply cautions against dying the diff halves. The Traxxas diff case is made of a different plastic from the rest of the kit's nylon parts. This plastic blend shouldn't be dyed, so you should paint it. CC

GET A TURBO ZETA

In your June '90 issue, you featured a Clod Buster in a "Home-Built Project" article. The article said that the Clod had an electronic speed controller, but my hobby dealer and some of my friends say that you can't run an ESC in a Clod Buster without frying the ESC. (One of them even proved it by burning his in less than 5 minutes.) How could the author run his Clod using an ESC without burning the controller?

Also, is it a good idea to put steel gears and Trinity Nuclear Assault drag motors in a Clod?

KYLE METCALFE
Middletown, IN

Kyle, your hobby dealer probably isn't familiar with PDI's reversing Turbo Zeta ESC, which is specifically designed for use in twin-motor trucks. Manufacturers of other new controllers claim their products have twin-motor capabilities, but to the best of my knowledge, they don't specify modified motors as does the PDI Zeta. I could be wrong. I know the Turbo Zeta's reputation, however. Yes, it's a little more expensive, but remember: buy cheap, and you buy twice. This is especially true of electronic speed controllers, and it isn't surprising when you consider the demands placed on them by twin-motor monsters. CC

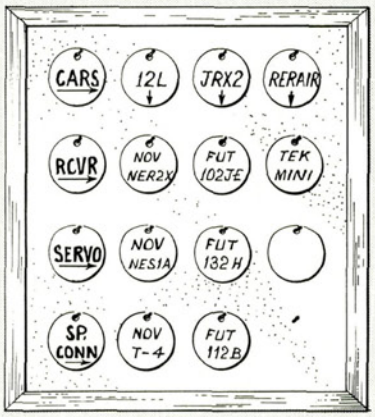
FIRST "YUGO" YES, THEN "YUGO" NO

What's the deal with this Rob Pegler guy? First he says he doesn't want to call monster trucks "junk," then he says they're like "Yugos against Porsches." Come on, man!—a monster truck is a monster truck, and a racing truck is a racing truck! What's so difficult about that?

I'm a newcomer to this hobby (less than a year), but I can see what's going on.

(Continued on page 20)

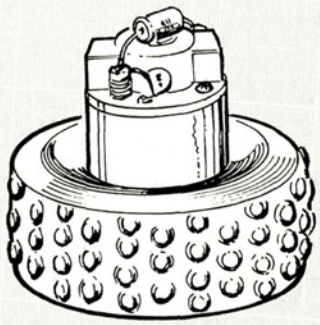
PIT TIPS



EQUIPMENT LOCATOR BOARD

Jay obviously has several cars and sets of R/C gears, and he made this board to keep track of everything. Drive a few rows of small nails into a piece of plywood or a small cork bulletin board, and hang little identifying card tags (available from most stationery stores) on the nails.

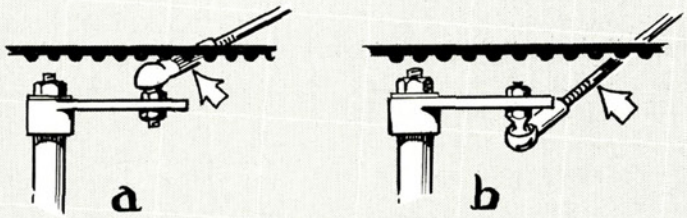
Jay Benton, Bozrah, CT



MOTOR HOLDER

Save an old tire or two, and use one to hold your motor vertical while you work on it.

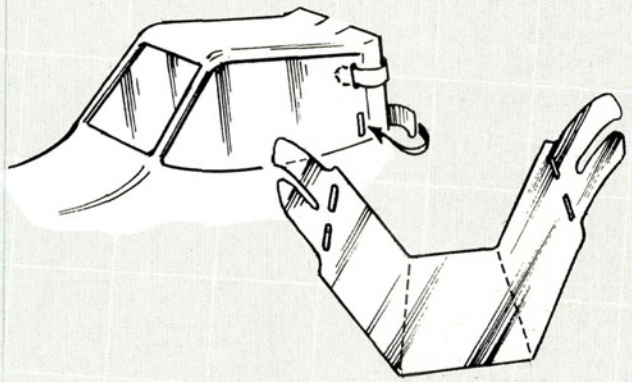
Eric Alfuth, Plano, TX



YZ-10 TIE ROD

To prevent his car's tie rod from touching the drive belt, this R/Cer re-routed the rod, moving it from above the servo-saver arm to below it. This was easily done by merely moving the ball link to the underside of the arm, as shown.

Fuad Malik, Upper Darby, PA

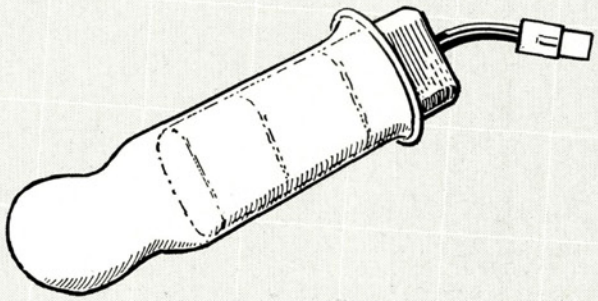


ULTIMA WINDSHIELD

Here's a new look for your Ultima! Use the type of transparent plastic that's used for book covers or report covers. Cut the windshield and side windows to the shape shown here. (The side tabs wrap around the roll bar before being fit into slots.) There's no room here to give you a full-size pattern, so use paper for your first attempts, and when you have the right shape, transfer it to the plastic. A tinted windshield would look really great!

Alec Dahl, Houston, TX

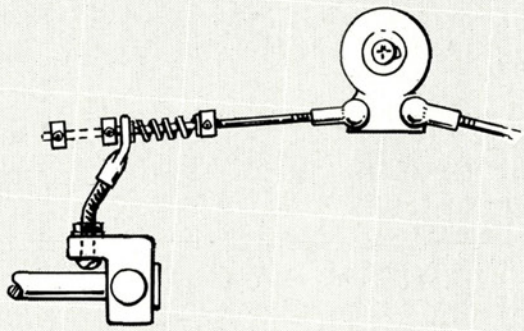
(Alec, we'll send a free subscription, when you send your complete address!... We're waiting!...)



NI-CD WATERPROOFING

Waterproof your Ni-Cd pack! Take a suitable rubber balloon, stretch its neck, and slip the Ni-Cd pack inside. Close the balloon's neck tightly with a piece of cord or a twist-tie.

Alex Tecson, Los Angeles, CA



SERVO-SAVER

This seems to be a back-up for the CRP servo-saver that was already installed. The regular steering arm (arrowed) has been replaced by a 2-inch machine screw and nut onto which a tie-rod end has been threaded. A pair of 1/16-inch collars and suitable springs form the rest of the mechanism, and it's easy to see how it protects the servo against hard steering shocks.

Pete Probelski, Westland, MI

Radio Control Car Action will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Pit Tips." Send rough sketch to Jim Newman, c/o **Radio Control Car Action,** 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

LETTERS

(Continued from page 18)

People like him want to race competitively, but they aren't going to the big ROAR events; they're going to the local track to compete and have fun. How would you feel about going to the track and finding out you didn't have a snowball's chance?

Yo, Rob! Let's say that we let these monster rucks run against racing trucks. Then you'll write a letter saying that you want them out, because they're not fast enough, and they're in your way. In my opinion, that's what you're saying now with phrases such as, "You can only stretch them so far." You're right, even if you put all that high-tech stuff into the "Yugos," they can't compete with the "Porsches." Besides, most kids don't have the money for all the high-tech stuff. So what if you spend a little more time at the track? When did you stop having fun there? As for NASCAR on ESPN, would you run your street Porsche against them?

Disgusted,
DOUG McCARTHY
Elkton, MD

Rob, you've ticked people off; make up your mind! Anybody else want to kick Rob while he's down? CC

HYPERDRIVE HYPE

I've been racing for about a year and a half with a TRX-T Eagle that runs well. I wondered if I could put a Hyperdrive in it. I've been told "Yes" and "No." I'm sick of getting the runaround, so I've decided to ask someone with common sense. [Editor's note: So he wrote to Chris??] If adding a Hyperdrive is possible, will it make my truck run faster and/or more smoothly?

I'm also looking for a new speed controller. Which one is better: the Novak NESC T-4, or the DuraTrax DTX-4? I need something that can handle a motor like the King Kong or the Godzilla. What kind of battery is best for such motors: a 7-cell SCE or a 7-cell SCR? (It has to last for 4 minutes.) You have the best mag in the business—keep it up.

KEVIN LaPLANTE
Chicopee, MA

Kevin, in my opinion, you don't need the Hyperdrive, especially with the new Eagle tranny that's coming out. For $50 (and your old Eagle tranny), Traxxas will send you the new one, a slipper clutch, a motor plate, a rear guard, a ball-diff rebuilding kit and—get this!—Traxxas will throw in its new bellcrank-steering upgrade to boot! Not bad for 50 bucks!

The controllers you mentioned are virtually identical, but if you want to use a Godzilla, which is a hot 12-wind single, and seven cells, you'll have to go with a better speed controller. CC

THINK "AFTER-MARKET"!

I enjoy reading your magazine. It's the greatest! I have a Radio Shack Golden Arrow, and I want to convert it into an on-road car. Are there any products that can help with the conversion? Also, is the Golden Arrow compatible with parts from other 2WD off-road cars?

MATT SHERMAN
Liverpool, NY

As far as I know, Radio Shack cars aren't compatible with the endless supply of options and hop-up goodies available at most hobby shops. In the future, you should buy a well-known car from your local hobby dealer, and then you'll be able to make modifications. I wish I had a different answer for you. CC

IT'S ALL TRUE?

At the Chicago Hobby Show, I stopped by Bud's Racing Products. In a recent "Inside Scoop," Chris Chianelli said that Bud put 10, 1/10-scale wings on his full-size car. I asked Bud if that was true, and he said it was a lie. In a prior "Inside Scoop," you said the new Airtronics Caliber has video games. Airtronics said it wasn't true. I'm not criticizing your magazine, I'm just saying next time you

make a joke (I assume that's what these were), make it clear to your readers. I hope we don't have to start calling "Inside Scoop" "The Enquirer."

KHAL DAGHESTANI
Skokie, IL

Khal, wait till you read my report on "Freddy," the talking speed controller!
CC

FREE RACERS, UNITE!

I have to sneak this letter to you, because I'm Amish. I took my childhood savings and bought a tricked-out Panda Stadium Racer. I can only use it for an hour or so, when my folks are in the fields. If they ever found out, they'd kill me. They almost killed me when they found out that there was a missing stamp (I took it to send this letter). I hope you can print this to show that Amish people can have R/C cars, too. It isn't fair that our traditions don't let me enjoy playing with R/C cars. We should be like you normal people. I'd like to get people like me interested in this hobby. I love your magazine, when I'm allowed to read it.

Name and Address Withheld

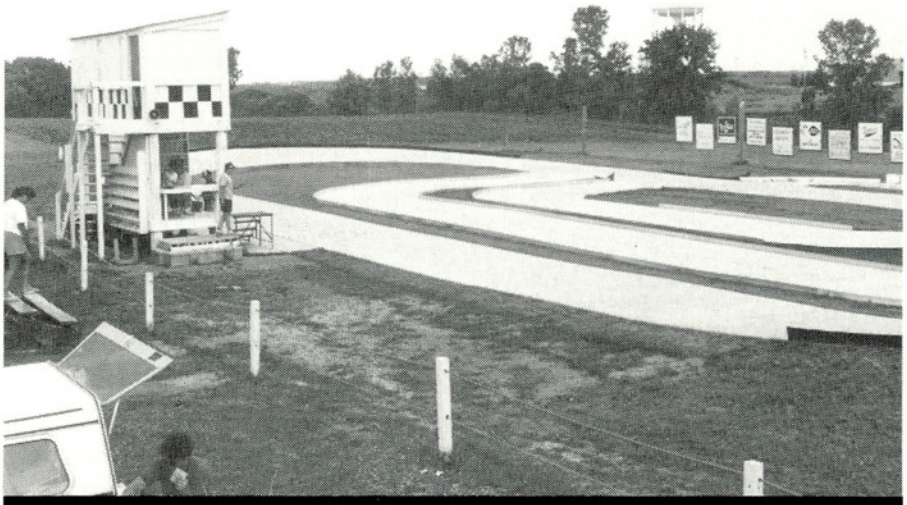
Dear Withheld, I don't know how normal (as you put it), "normal people" are, but I'd like, with all due respect, to assure your good people, the Amish, that our hobby is healthy, clean and 97-percent nonpolluting. If they have any doubts, they can contact me. On second thought, maybe they should contact Steve Pond.
CC

WHERE TO WRITE TO US

If you're writing to us (and we'd love to hear from you), please be sure to address your letters to "Letters," *Radio Control Car Action*, 251 Danbury Road, Wilton, CT 06897. Only subscription orders and inquiries are handled by our Customer Service Department in Mount Morris, IL; other mail addressed there must be forwarded to us in Connecticut, and this leads to long delays.

HOT TRACKS

Here's another in our "Hot Tracks" series of outstanding R/C race courses. To see your favorite track featured here, send us good black-and-white photos and a description of its delights! (approximately 500 words). Send your entries to Hot Tracks, Radio Control Car Action, 251 Danbury Rd., Wilton, CT 06897.



MR. CAR RACEWAY, MARSHALLTOWN, IA

MR. CAR (Marshalltown R/C Auto Racing) is a non-profit club dedicated to providing its members with inexpensive 1/10-scale racing.

In the last two years, members have transformed a bare lot at the Central Iowa Fairgrounds into a world-class speedway. They started with a 390-foot, concrete, banked oval and, this year, added a 245-foot roadcourse. There's also a concrete pit area for enduro superspeedway racing and an AMB lap-counting system.

The track was built using the latest technology: the concrete contains glass fibers, and a fiberglass reinforcing rod was used to eliminate possible glitches caused by the steel-reinforcing material.

Club members race for $3 per class; nonmembers can compete for $6 per class. The weekly races provide outstanding competition and draw contestants from all over central Iowa. Special events, such as the National On-Road Enduro Championship, which was held in August 1990, have attracted racers from Minneapolis, Kansas City and Omaha. The on-road classes, which are run on a 635-foot combined course, are the most popular.

If you're in the area, check out MR. CAR Raceway at the Central Iowa Fairgrounds, East Olive St., Marshalltown, IA 50158. For more information, call them at (515) 483-2234.

READERS' RIDES

In "Readers' Rides," we recognize the unique, innovative—and sometimes bizarre!—vehicles that our readers have created. Send us a sharp, uncluttered, well-exposed color photo of your car or truck (no Polaroids, please!), along with a brief description, to Readers' Rides, R/C Car Action, 251 Danbury Rd., Wilton, CT 06897. If the Ayatollah chooses your photo, you'll receive a one-year subscription to Car Action, or an extension to your existing subscription. You'll also be eligible for the third annual "Reader's Ride of the Year Contest" in the fall of 1991. Write your address and phone number on your letter and on the back of each photo you send, in case we need to contact you.

AYE, CARUMBA!

John W. Rosa (of Lake Hopatcong, NJ) had a Bolink Eliminator that worked well, but he needed an attention-grabbing body. Noting the Simpsons' popularity (and being a fan), he creatively sliced some bumper stickers and came up with this wild radical Bartmobile. The Simpson Slingshot is a purist's nightmare, but that suits John just fine!

ONE COOL CAT

The elusive Jimmy Joe, who hails from Mount Maunsanui, New Zealand, sent us this quick pic of his current ride—a Schumacher Pro Cat. He laid on a really cool paint job and then set out to make it run—not well, but *great!* A Novak T-1X, a Twister motor and a Wasp short belt help this car live up to Jimmy's high expectations. This Cat makes heads turn and tires burn!

BATTERING BROTHERS

The Bruise Brothers are back! Robert and Brandon Lamb (ages 13 and 8) have some of the wildest rides seen yet—racing trucks! Both are JR-XTs armed with Tekin ESCs, Airtronics radios and a host of other goodies to keep the competition on their toes. Team Swollen is the brothers' sponsor, and bruises are what they give!

GETTIN' GASSED!

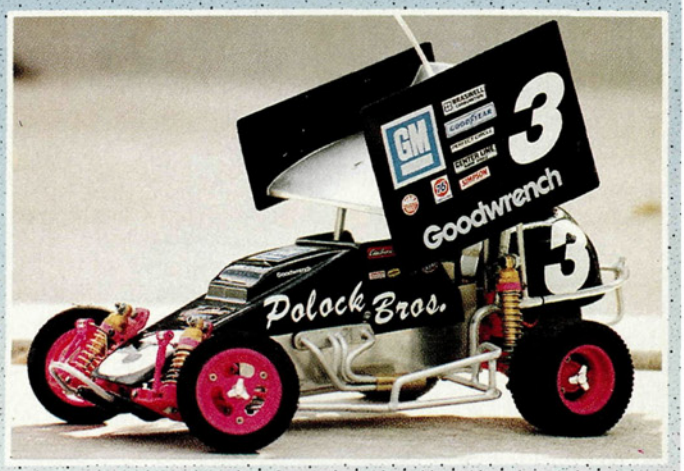
Here's a pair of JR-X2s from Little Falls, MN. Dan Ledbetter's ride sports a B&R Bullet stock motor, a Novak T-1X ESC, a Futaba Magnum Jr. radio and Pro-Line wheels. Tired of charging and discharging, peaking and re-peaking, Dan's friend Kurt Novotny decided to convert *his* JR-X2 to gas. With a vision—and a hacksaw!—he set to work installing a Sullivan fuel tank, a Futaba Attack R radio and an O.S. Max CZR engine using custom motor mounts. Gee, Kurt, getting a little tired of those pokey, 9-turn motors?

IT'S DA GREEN MONSTER!

Calling all cars, calling all cars! Be on the lookout for a green Clod Buster with a green monster in tow. Fred Januszewski first spotted this dangerous pair emerging from a dark forest in the area of Spotswood, NJ. Reported to have a Sassy Chassis, a Turbo Zeta ESC and a 4000mAh battery, these two dastardly villains are considered armed and very dangerous. Be on the lookout!

DOWN-UNDER DUO

From the land down under comes this duo of cars set up for high-speed oval racing. They're owned by R.S. Miller (of Holsworthy, Australia), who races at a local velodrome with the Tempe Velodrome Radio Control Car Club. The blue-and-white striped Pontiac is a Hyper 10 Sportsman, and the green-and-gold Olds is a Lazer Lite Shadow. The dent in the Olds is the result of trying to squeeze the 3-inch-high car under a fence that's only 1 inch off the ground! I guess Americans aren't the only ones who know how to smash up a stock car!



SUPER SPRINT

From the very creative workshop of Dick Nicoski comes his latest creation—a Big Boy Toys/RC10 sprint car. The body is done in a Dale Earnhart motif, and the nylon suspension parts are dyed with hot-pink Litespeed dye. A Pocket Rocket motor pushes the power through a set of Robinson gears. Be careful of this sprint car, because the best thing it does is turn right—or is that left?!

time warp

circa 1979

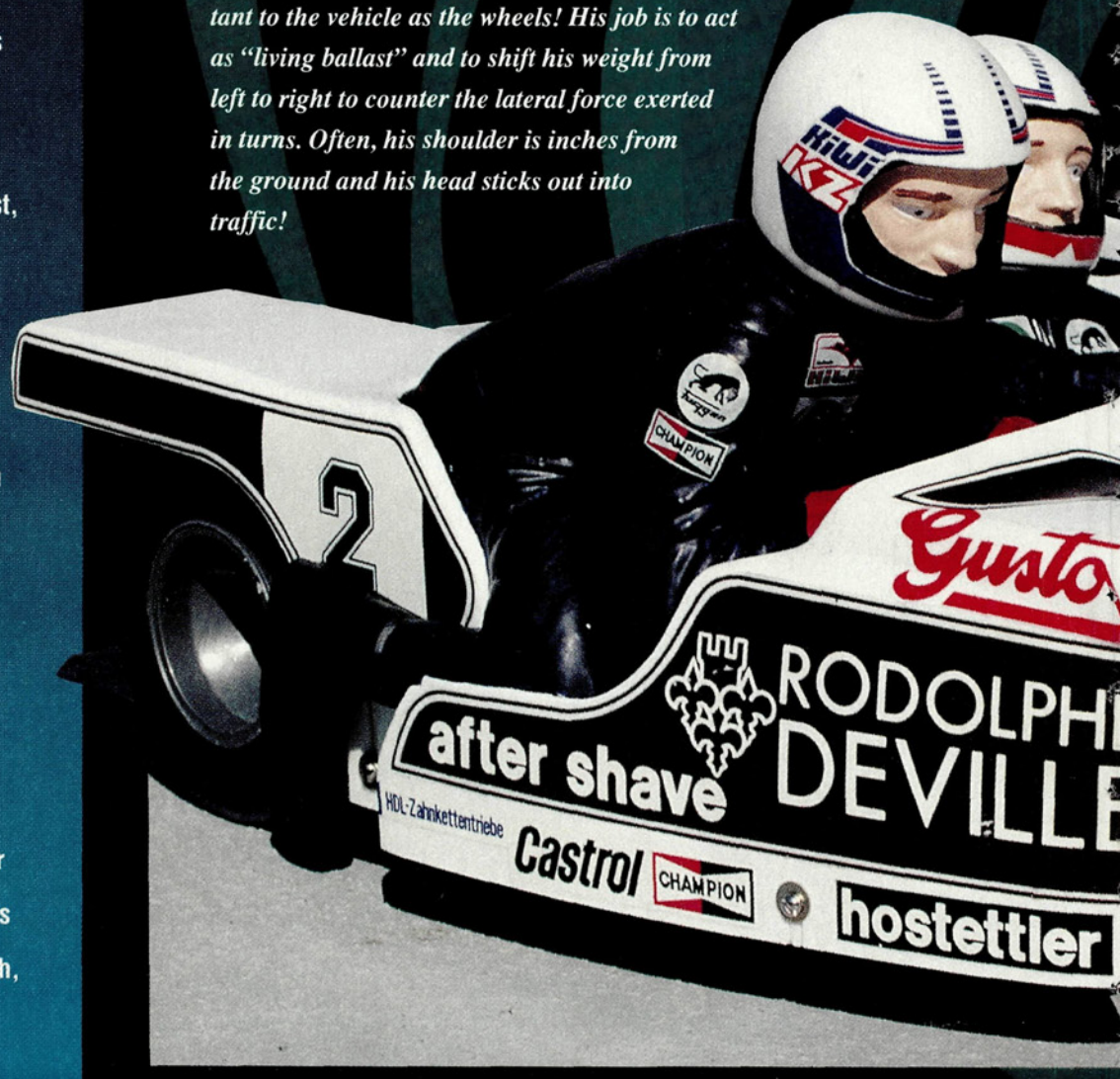
In 1976, if you wanted a real R/C electric car, i.e., one with proportional steering and throttle control, you had only a few choices. Tamiya's first car was a Porsche 934 powered by four (yes, four!) dry C-cells. It wasn't very fast, but it ran for a long time.

Since then, R/C cars have come a long way. The slow, dry-cell-powered, on/off-steering vehicle that kids ran in their living rooms has developed into a complex machine that's capable of 70+mph on a 950-foot, banked-oval raceway!

In "Time Warp," we look back at the cars of yesteryear that paved the way for today's racebred buggies. This month, we feature the Tamiya B2B Sidecar racer, which was introduced in 1979.

I DON'T KNOW why sidecar racing hasn't been as popular here as in Europe. I guess people put it in the same category as hovercraft racing—foreign. If you've ever seen sidecar racing, though, you know how interesting it is. No other sport combines such exciting acrobatic action, speed and competition.

Sidecar racing is a true melding of man and machine. The passenger isn't just along for a joy ride; he's as important to the vehicle as the wheels! His job is to act as "living ballast" and to shift his weight from left to right to counter the lateral force exerted in turns. Often, his shoulder is inches from the ground and his head sticks out into traffic!



ion sickness!

Tamiya sideCAR B2B

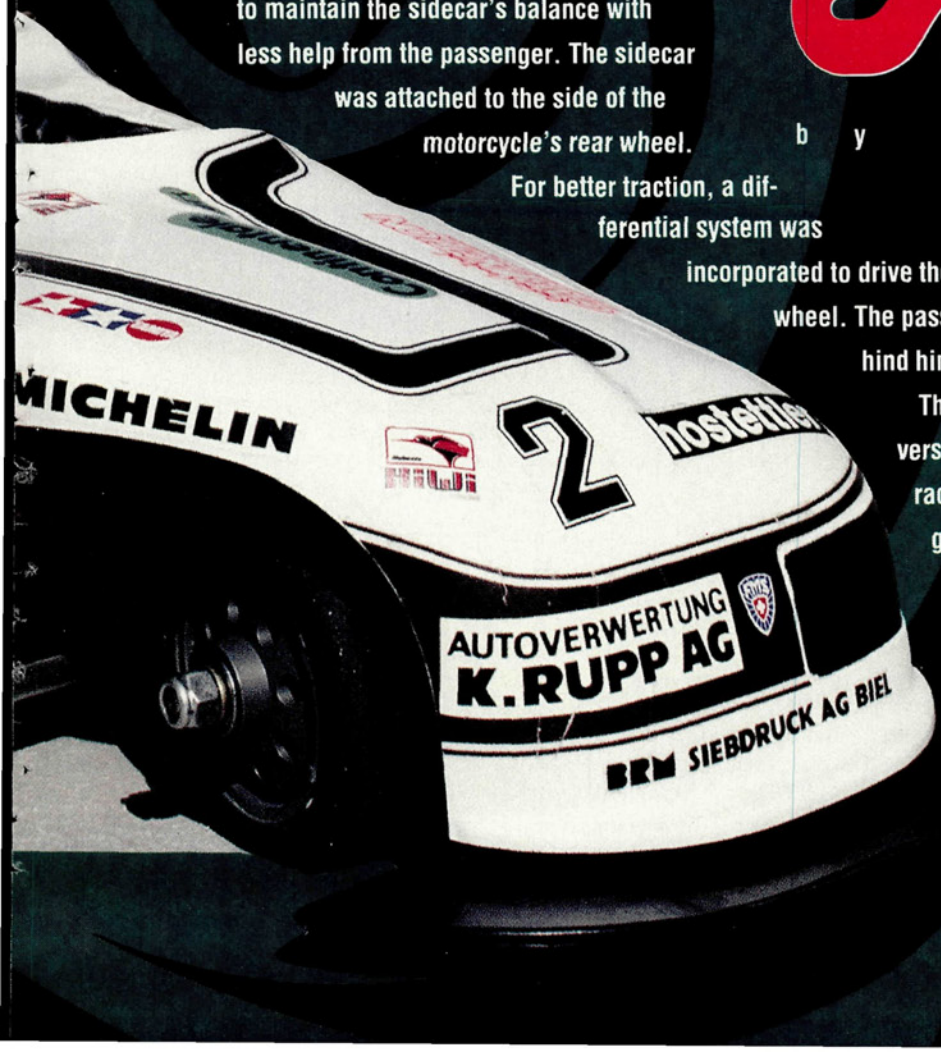
by JOHN HUBER

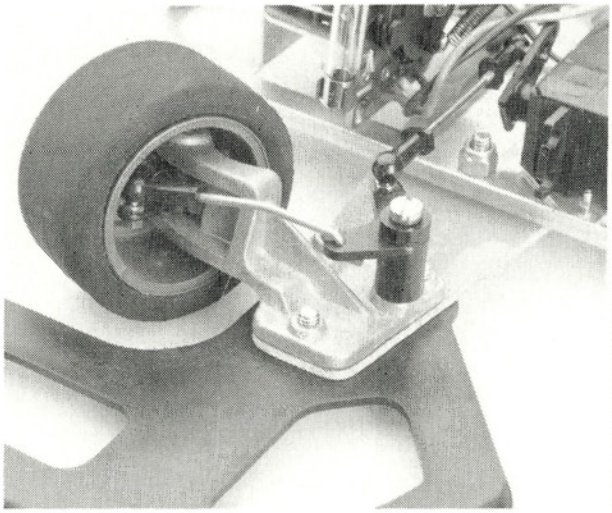
B2 OR B2B?— THAT IS THE QUESTION!

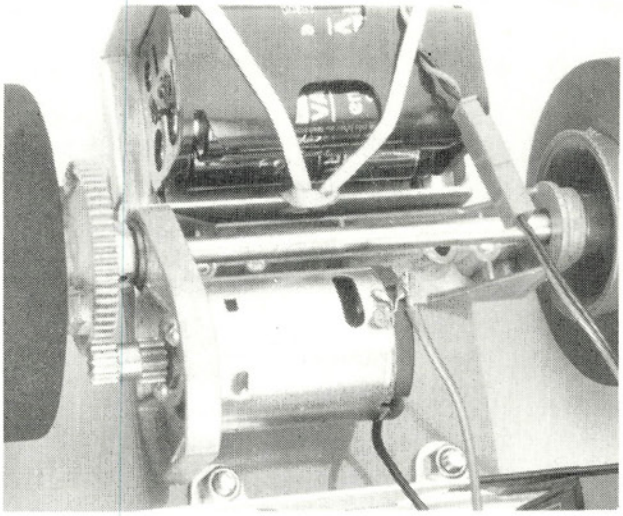
The B2 class was designed for sidecars with a displacement of up to 500cc. For more than 20 years, BMW dominated this form of racing with its 4-stroke engines, until a 2-stroke won the World Championship in 1975. Since then, most teams have switched to 2-stroke.

In 1978, a revolutionary new body design appeared. The principal behind it?— to maintain the sidecar's balance with less help from the passenger. The sidecar was attached to the side of the motorcycle's rear wheel. For better traction, a differential system was incorporated to drive the sidecar's wheel as well as the bike's rear wheel. The passenger sat in a bucket seat with the engine behind him.

This successful new design created much controversy, but it was within the legal guidelines for racing. The B2B class was born, and it distinguishes the later bikes (after 1979) from the earlier B2 class. The sidecar shown here is from circa 1979, and I'm sure there have been more significant changes in engines and designs since then.







■ *Above left: The bellcrank steering system controls the single front wheel very well. Notice the non-suspension front arm with lots of caster.*

■ *Above right: With the exception of the gear diff, the direct-drive system is similar to ones we have today. Note the dual pinion gear. It's possible to mount a 540 motor, but the car would be really overpowered.*

LOST IN TIME

By now, you're probably wondering what the deal is with this kit. I'm sorry to say that it's no longer available. Released in December 1979, it was one of the first Tamiya models designed for R/C operation. It's a blend of fine plastic modeling and R/C. It took me much longer to detail the kit than it did to build it, but where did I get it?

I first saw the model about 10 years ago in my friend's Tamiya catalogue. He owned a 1/12-scale car, but I didn't like the fact that the batteries died so quickly. I wasn't then into R/C, because it didn't seem very advanced: the cars were expensive, slow and had to be charged overnight for just 10 minutes of fun the next day.

Five years later, when I was just getting into R/C, I went to a hobby shop in my area. (Actually, it was more of a crafts store with some plastic models.) I didn't get a chance to look around the place because the owner was paranoid about shoplifters, but I noticed the sidecar kit on a shelf.

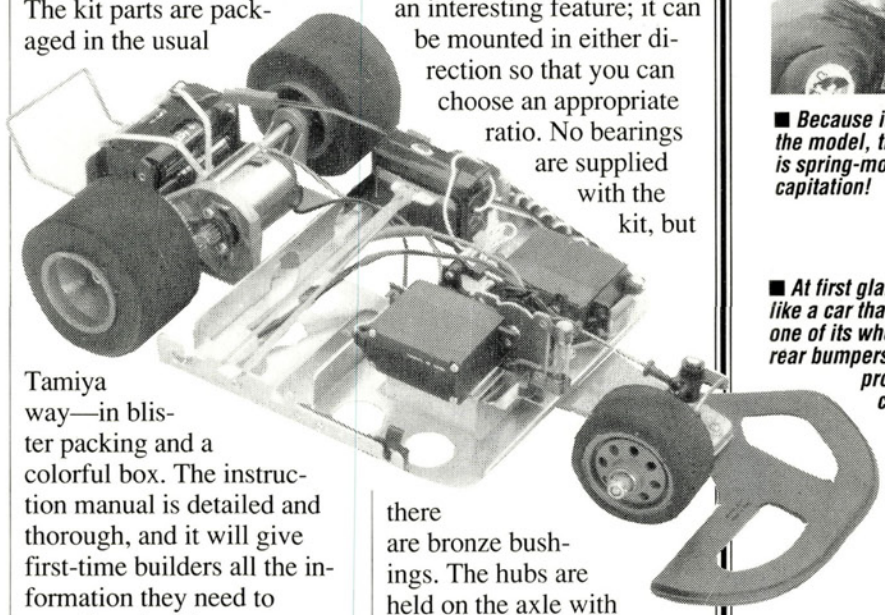
This year, after seeing some old models that Steve Pond had found, I went back to that hobby shop on a whim, not knowing whether the place would still be in business. The same lady was sitting out front feeding pigeons, so I asked her if she still had the kit I had seen there 5 years ago. To my surprise, she said she did and promptly added that she only accepts cash. I had no problem with that and reached for my wallet. I couldn't believe no one else had bought the kit before me. I guess not too many people get a chance to look around!

THE KIT

The kit parts are packaged in the usual Tamiya way—in blister packing and a colorful box. The instruction manual is detailed and thorough, and it will give first-time builders all the information they need to complete the kit.

Assembly begins with the radio installation. The radio gear and battery are mounted on an aluminum tray. The speed controller is a crude two-step device with a fuse for protection, and a 5-cell pack powers the tiny RS-380 motor. You can tell this isn't going to be a rocket!

A primitive dual bevel-gear setup gives you the option of making the drive system direct drive or differential drive. The company recommends that you use the direct-drive gear for truing the tires. The kit's double-sided pinion gear is an interesting feature; it can be mounted in either direction so that you can choose an appropriate ratio. No bearings are supplied with the kit, but there are bronze bushings. The hubs are held on the axle with brass setscrews—yes, brass!

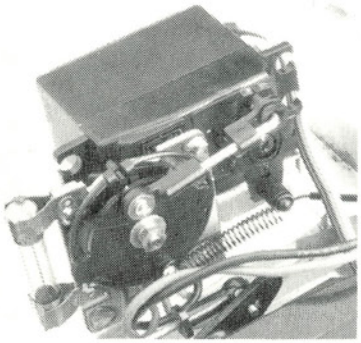


■ *Because it's the highest part of the model, the passenger's head is spring-mounted to prevent decapitation!*

■ *At first glance, the B2B looks like a car that has sheared off one of its wheels. The front and rear bumpers do a great job of protecting the vital components from damage.*

sideCAR

The front end has an unusually large amount of caster—so much that when the wheel is turned fully in either direction, only one edge of the tire touches the ground. The front-end geometry is well-designed, and a bellcrank is used for the servo connection. There's no front or rear suspension; the only thing that helps the sidecar handle the road's bumps is the flexible fiberglass chassis. A receiver pack sits in an aluminum tray behind the motor and axle.



This is a primitive two-step speed controller. The 15-amp fuse is ample protection for the 380 motor and shouldn't blow under normal use. A circular spring is used as a servo-saver.

DETAILS, DETAILS

Because the model is 1/8 scale, the driver and passenger are large and easy to detail. The driver's head is mounted with a screw so it can rotate, but what interested me was the passenger's head. It's held in place by a small spring, and this allows it to flex when the sidecar rolls.

Type ..... On-road
Scale 1/8
Sug. Retail Price ..... N/A

DIMENSIONS:
Overall Length ..... 13 inches
Width ..... 8 inches
Wheelbase ..... 8.75 inches
Front Track ..... None
Rear Track ..... 5.75 inches

WEIGHT:
Gross (w/battery) ..... 2 pounds, 9.13 ounces

BODY:
Type ..... B2B Sidecar
Material ..... Polystyrene resin

CHASSIS:
Type ..... Pan
Material ... Fiberglass/aluminum

DRIVE TRAIN:
Primary ..... Gear/pinion
Differentials .... Twin bevel gear
Bearings/Bushings ..... Bronze bushings

SUSPENSION:
Type (f/r) ..... None
Damping (f/r) ..... None

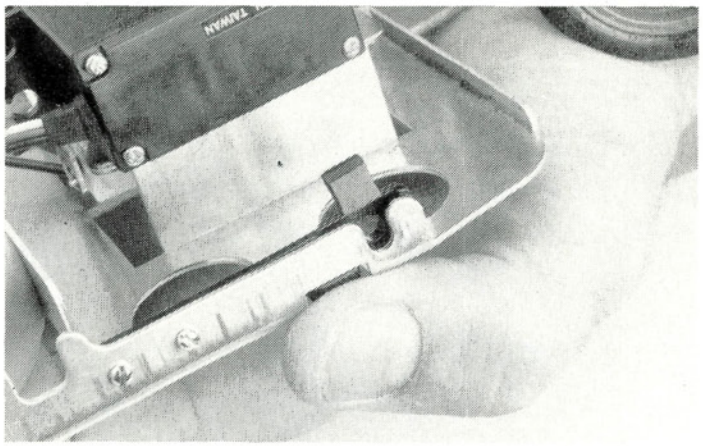
WHEELS:
Front: Type ..... One piece plastic
Dimensions (DxW) ..... 1.3x1 inches
Rear: Type .... One-piece plastic
Dimensions (DxW) ..... 1.4x1.4 inches

TIRES:
Front ..... Semi-pneumatic rubber
Rear ..... Foam rubber

ELECTRICS:
Motor RS-380
Battery 5-cell
Speed Controller ..... 2-step forward/reverse

OPTIONS AS TESTED:
Futaba Attack stick radio; 6-cell SCE batter

COMMENTS:
The B2B Sidecar handled well for an 11-year-old R/C vehicle, and because it didn't go very fast, the absence of suspension wasn't apparent. The body-mounting system is a novel idea that's easy to work with. The detailing is topnotch and looks very realistic.



Two release catches under the polystyrene body make it easy to remove.

To mount the body, key the two brass pieces on its rear into slots in the chassis. Two more mounts on the front snap into catches on either side of the chassis. To remove the body, simply pull the two front release tabs and lift!

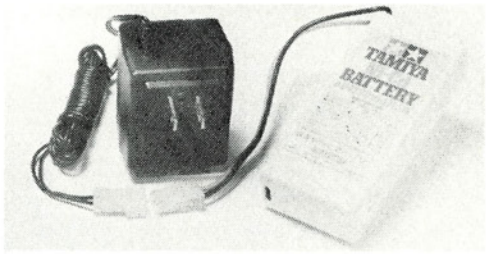
TESTING TIME

I went to an indoor oval track, and because I knew finding replacement parts would be almost impossible, I removed the body for the test runs.

The Tamiya Sidecar drove smoothly around the track and handled well. It had a little oversteer (surprising—it has only one front wheel), and this was partly caused by the rubber front tire and 10-year-old rear foams. I hit the wall, but didn't do any damage; the front and rear bumpers protected the vehicle, and after a couple of minutes, I was doing quite well .

I couldn't find any old 5-cell packs, so I used a 6-cell SCE, and the sidecar ran for more than 30 minutes! I was dizzy watching it go around, and the battery showed no signs of dumping, so I packed it in. People were very interested in this odd-looking vehicle—surprised that it was *10 years* old.

Now, I think I'll save it on a shelf; after all, it's a unique collectors' item. Going back to an early R/C machine was a lot of fun, and it gave me a better understanding of how far we've come in the past decade. If you see one of these old sidecars in a hobby shop, grab it. Who knows? Maybe they'll gain in popularity, and a new racing class will be formed!



Way back, we charged 5-cell packs overnight with a trickle-charger for 10 minutes of fun the next day.

**Here's the address of the company featured in this article:*
MRC/Tamiya, *200 Carter Dr., P.O. Box 267, Edison, NJ 08818* ■

Losi gets loaded!

TEAM LOSI

JRX-PRO

by STEVE POND

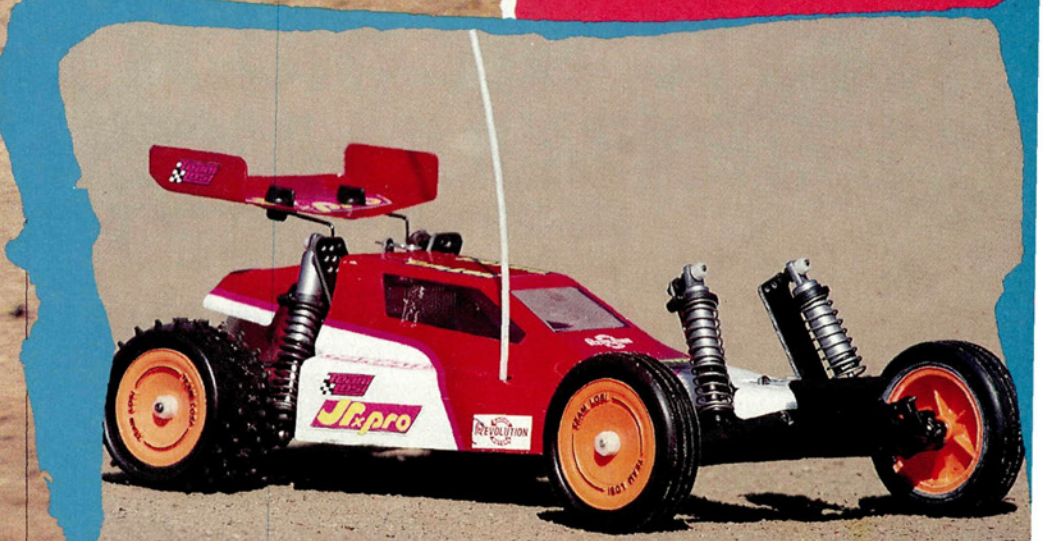
JUST WHEN YOU thought you'd seen it all in high-performance off-road racing cars, Team Losi* comes out with its new JRX-Pro! Is the Pro a radical new racing design that costs a fortune? Nope! It's based on the original JR-X2, but it has a number of race-tested performance refinements that will increase the gap between you and the competition.

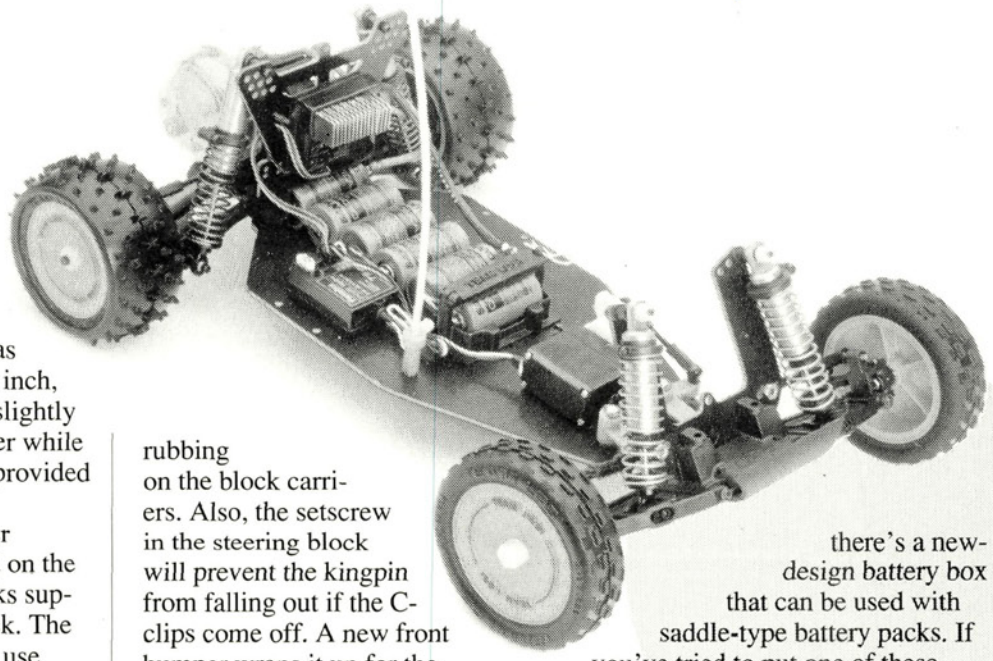
NEW STUFF

Starting from the ground up, the changes include a thicker, longer, graphite chassis plate that was originally designed for Losi's JRX-T racing truck. The increase in length improves straight-line stability, and the thicker graphite increases rigidity. (This will also prevent chassis flexing and allow the suspension to soak up the bumps.)

The front suspension still has the standard A-arms with adjustable upper links, but it, too, has been modified to enhance the car's handling.

(Continued on page 39)





The front shocks and shock tower are longer (for increased suspension travel), and the linkages have been changed to accommodate this increase in length. The steering rack has been shortened by about 1/4 inch, and the steering linkage is slightly longer to prevent bump steer while using the additional travel provided by the longer shocks.

Instead of the servo-saver bellcranks that are standard on the JR-X2, new, solid bellcranks support the shorter steering rack. The new bellcrank design is for use with a servo-saver that's mounted on the servo—a feature that really improves steering response. A nice touch here is a chassis-plate cutout in which the servo is installed. It allows the use of the larger, stronger, Kimbrough* servo-saver, which has greater spring tension than the standard-size servo-savers and keeps the wheels pointed where *you* want them to go, even during hard cornering.

At the ends of the front suspension arms, new steering blocks hold the kingpin in place with a setscrew. This can quicken the steering response by preventing the C-clips that are installed on the top and bottom from rubbing on the block carriers. Also, the setscrew in the steering block will prevent the kingpin from falling out if the C-clips come off. A new front bumper wraps it up for the front end; it's installed below the chassis, without using a spacer under the front bulkhead, and this allows more aggressive steering.

In the middle of the chassis plate, there's a new-design battery box that can be used with saddle-type battery packs. If you've tried to put one of these packs into the old JR-X2's battery box, you'll appreciate this change. What's more; this battery box's hinge is unlikely to break—ever!

SPECIFICATIONS

Type	**Off-road**
Scale	**1/10**
Sug. Retail Price	**$309.95**
DIMENSIONS:	
Overall Length	**15 inches**
Width	**9.75 inches**
Wheelbase	**11.25 inches**
Front Track	**8.5 inches**
Rear Track	**8 inches**
WEIGHT:	
Gross (w/battery)	**3 pounds, 6.24 ounces**
BODY:	
Type	**Single-seat off-roader**
Material	**Polycarbonate**
CHASSIS:	
Type	**Pan**
Material	**Graphite**
DRIVE TRAIN:	
Primary	**Spur**
Transmission	**Gear**
Differential	**Ball**
Bearings/Bushings	**Ball bearings**
SUSPENSION:	
Front: Type	**Single A-arm with upper control link**
Dampening	**Oil-filled, coil-over shock**
Rear: Type	**Single H-arm with upper control link**
Dampening	**Oil-filled, coil-over shock**
WHEELS:	
Front: Type	**One-piece nylon**
Dimensions (DxW)	**2.1x.875 inches**
Rear: Type	**One-piece nylon**
Dimensions (DxW)	**2x1.375 inches**
TIRES:	
Front	**Stagger-rib**
Rear	**X-pattern**
ELECTRICS:	
Motor	**None**
Battery	**None**
Speed Controller	**None**

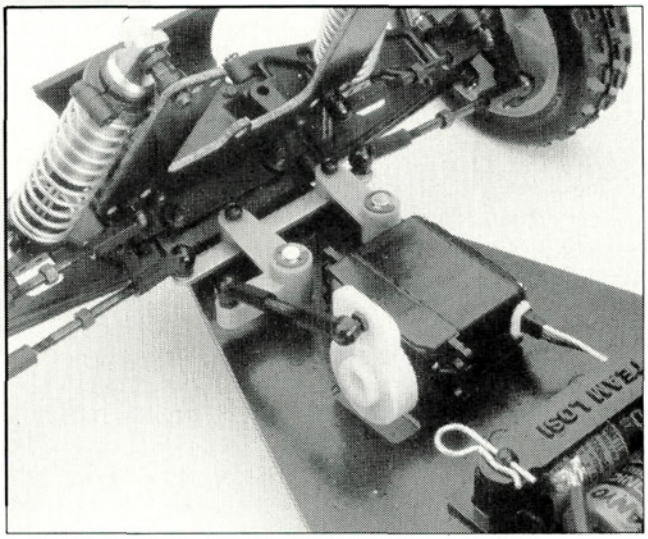
OPTIONS AS TESTED:
Team Losi Motown Missile and Jr's Choice motors; Tekin 411P; Futaba PCM Radio and 9101 servo; Team Losi Super Sliders; Trinity Pushed 1400 SCRs and 1700 SCEs; large Kimbrough servo-saver.

COMMENTS:
The JRX-Pro is the most advanced 2WD racing car available, but its adjustment possibilities might be too much for less experienced drivers. Compared with the JR-X2, its many small design changes make the Pro a more responsive machine that requires an equal improvement in driving ability. Assembly is very simple, and an ample supply of readily available parts should keep the car on active duty. With a retail price that's only $10 more than the price of the standard JR-X2, the Pro is a good buy for seasoned racers.

Compared with the JR-X2, its many small design changes make the Pro a more responsive machine that requires an equal improvement in driving ability.

REAR-END MODS

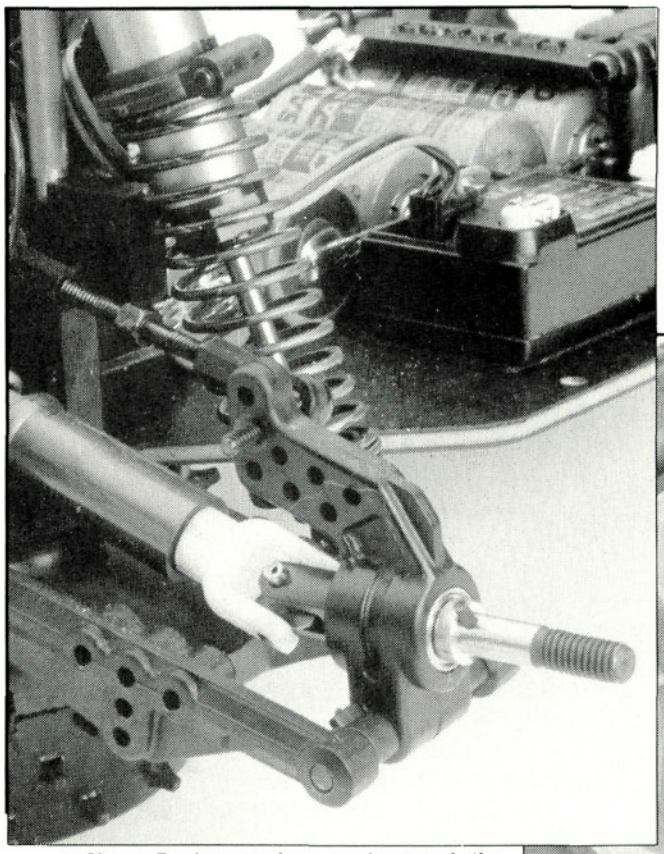
The Pro's rear end has the most modifications. It's designed around the use of the H-arm suspension that has been available for some time as an option for the JR-X2. The H-arms allow more aggressive steering, but they were previously limited to high-traction surfaces. Other changes to the rear suspension make it effective on a wider variety of surfaces. The shock tower (the same as the one in the old Pro conversion kit) has been moved away from the rear bulkhead with a spacer, and the shocks are now mounted on the rear of the tower instead of on the front, where they were mounted when the X2 was modified to use H-arms. The bulkhead is only slightly modified with the addition of an inboard hole (on each side) for ball links to which the upper links are attached. (Previously, to convert to using H-arms, you had to drill this hole yourself.) When the shocks are in place, they're angled toward the car's rear, and this keeps them in line with the suspension arm's movement when they're compressed. Also, to increase suspension travel, the rear shocks have been extended by .3 inch.

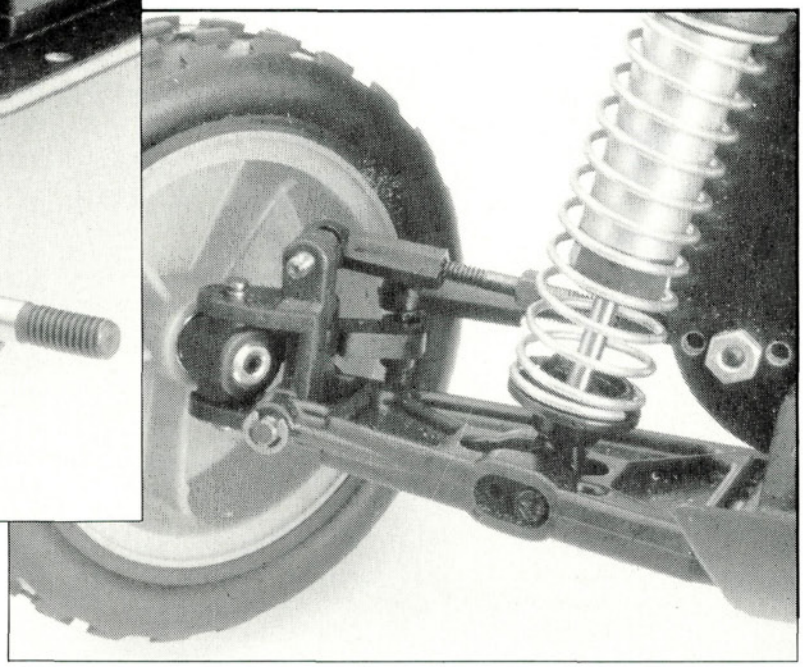


The Pro's solid bellcranks allow more precise steering.

The Pro's standard suspension H-arms are made of a harder material to prevent them from twisting and bending when they're subjected to heavy loads. The insides of the H-arms are supported by one of the four supplied rear pivot supports (your choice) that were designed for various degrees of caster and toe-in on the rear. Another modification is attached to the outside of each H-arm—new axle hubs designed exclusively for these arms. These hubs are substantially lighter than the originals and they're much more adjustable.

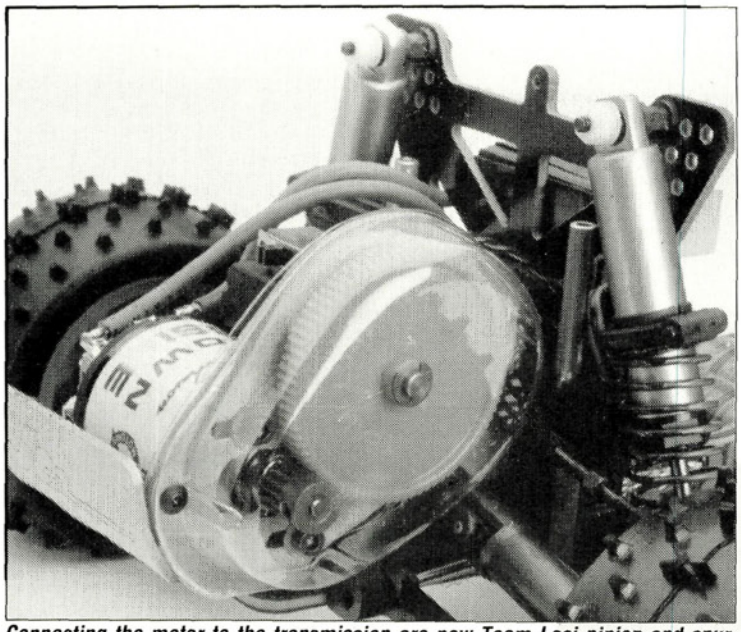
The Pro's transmission is essentially unchanged: it has a center-mounted ball differential and what Team Losi calls "low rotating mass." Low rotating mass is ac-





• Above: For increased suspension travel, the rear shocks included with the Pro kit are .3 inch longer than the standard Losi rear shocks.

• Right: A setscrew in the steering hub locks the kingpin in place. Even if the E-clips holding the kingpin loosen, the setscrew will keep everything secure.



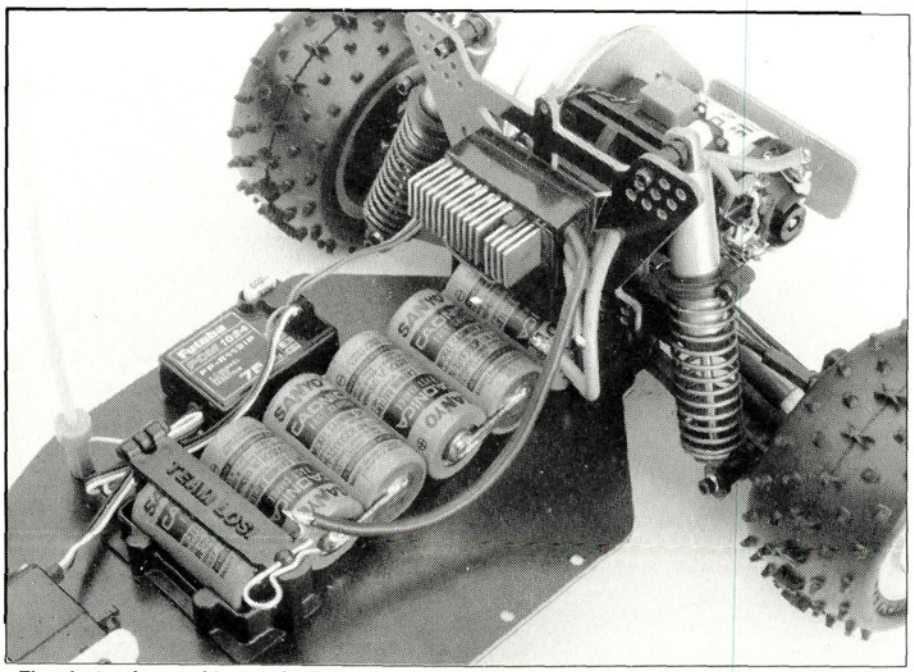
Connecting the motor to the transmission are new Team Losi pinion and spur gears that run extremely true and produce minimum drag.

complished by using light transmission components with a higher-than-average internal gear ratio. This translates into moving a lower weight at a slower speed. Its primary benefit is quicker acceleration, but there are other benefits, too.

Just about the only transmission modification is a new gear that's attached to the upper shaft. The original used a brass gear that was pressed onto the the shaft. It worked well, but the hard, abrasive material used in the other diff gears accelerated wear. The Pro's transmission has a plated, nickel-steel gear that slides over the shaft and onto a locating pin. The hardness of this new material should ensure that the gear outlasts the rest of the car, but on the outside chance that the gear might have to be replaced, you can do it just by removing a C-clip.

Those of you who have already looked at the Pro might have noticed that it has a new red spur gear. Not only is its color different, but it's also a new design that features beveled edges on the teeth. I assume

(Continued on page 91)



The electronics used to test the Pro included a Futaba PCM radio, a Tekin 411P speed controller and a Team Losi Motown Missile motor.

GASOLINE ALLEY

Picco P5 Engine

At Car Action, we always move with the times (why be modest?—we're way out in front!!) so, noting the resurgence in popularity of R/C gas-powered cars, we asked our super-scientist engine expert Mike Billinton to probe the powerplants and teach us the technology. Think you can cope? Read on! Peek at the Picco with Professor Probe.

by MIKE BILLINTON

HERE'S A 1990 update of Gualtiero Picco's five-port 1/8-scale top-running car engine! On the outside, little seems to have changed since I checked out this model in '86 (apart from the new cosmetic black semi-matte finish), but on the *inside*, how things have changed! This is just what we'd expect from this dynamic Italian engine designer.

SMALL CHANGES; BIG IMPROVEMENT!

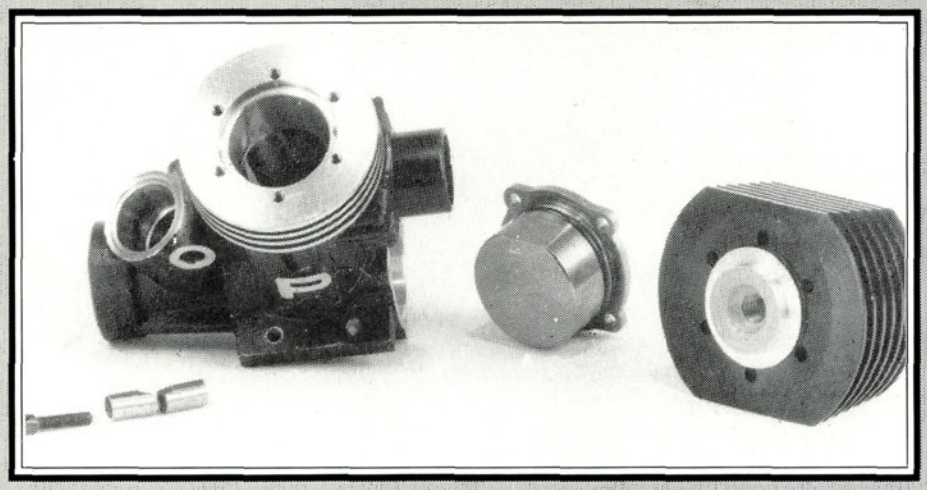
A few small changes have led to a marked improvement in performance. The Picco 3.5cc is now slightly more powerful than the famous early versions of the 1985 Nova-Rossi Black- and Red-head engines, and it's only just below the 1.8hp of the 1984 oil-cooled Rossi 21.

Its design features include: a one-piece crankcase; front-inducted crankshaft; rear exhaust; ABC piston/liner combination with Schnuerle porting (with two extra ports: five instead of three); heat-sink cylinder heads; and rugged, simple carburetors that have main and secondary needles and slide-throttle barrels.

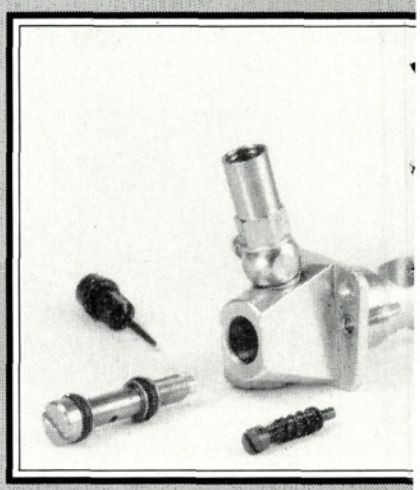
The Picco P5 has all these features inside a sleek, rugged exterior; in fact, it's an eye-catching product with great marketing appeal.

GREAT FEATURES!

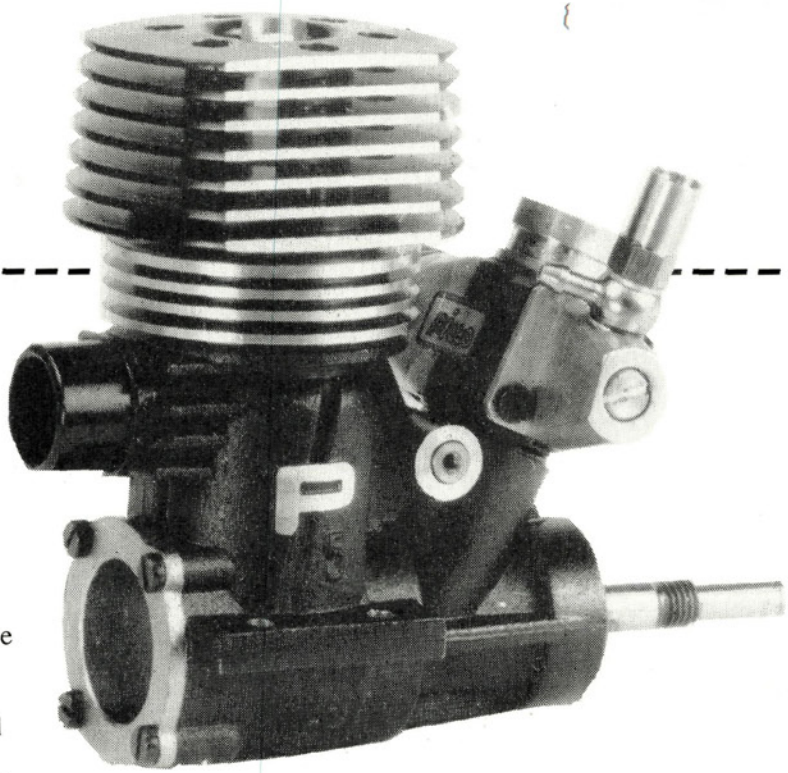
- The rear cover is nickel-plated to prevent wear caused by the connecting-rod big end.
- The crankshaft induction throughway is flared-out at the web position, and the bore size is tapered slightly from 9.9m. at the web to 9.6mm at the far end.
- The exhaust timing has been slightly increased from 158 degrees to 163 degrees, with transfer timing at 117 degrees. This now gives a blow-down of 23 degrees for a reasonably effective tuned-pipe response.
- Because of this, the effective compression ratio was slightly lowered (6.6:1) to avoid excessive cylinder pressure.
- The squish band is unusual because it's actually *two*



The two-piece carburetor-clamp bolt proved solid and effective during the tests. Apply thread-locking compound to the small bolt because of the engine's very high-rpm operating range. The "Siamese" twin transfer passage is just visible inside the cylinder. The backplate is nickel-plated to minimize big-end wear.



The carburetor is of molded aluminum and hi ringed" for leak-proof, reliable settings.



bands: an inner one at a .018-inch clearance and an outer, narrower one set at a tighter .014 inch. Both are at 0 degrees, and they probably have the same effect as an angled squish-band.

- The carburetor locking screw is the highly effective "two-part" pinch-bolt style, but even this one can benefit from a little Loctite where it counts!
- A plated, light-alloy throttle barrel runs inside a body of molded plastic and aluminum. This reduces wear at this critical area and helps to maintain good, constant fuel settings.
- The sleek, well-made connecting rod has phosphor-bronze bushings at both ends.

POWER TESTS

Initial rpm checks quickly showed this engine's potential, and after a short running-in period, I started the torque tests.

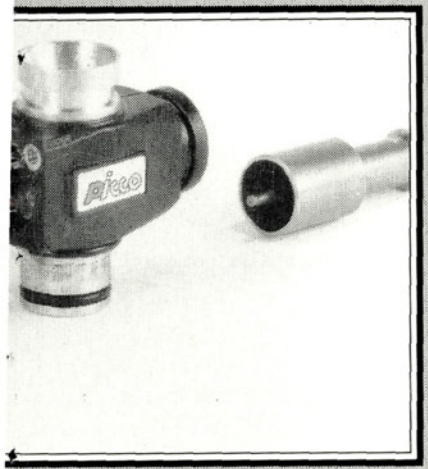
Test 1. Open exhaust: fuel—5 percent nitromethane/10 percent castor oil/5 percent ML70 synthetic oil/80 percent methanol. Plug—OPS 300.

Starting at 9,500rpm, the Picco P5 revved up to almost 30,000rpm (a performance that's typical of all modern, efficient, racing 2-strokes of this capacity).

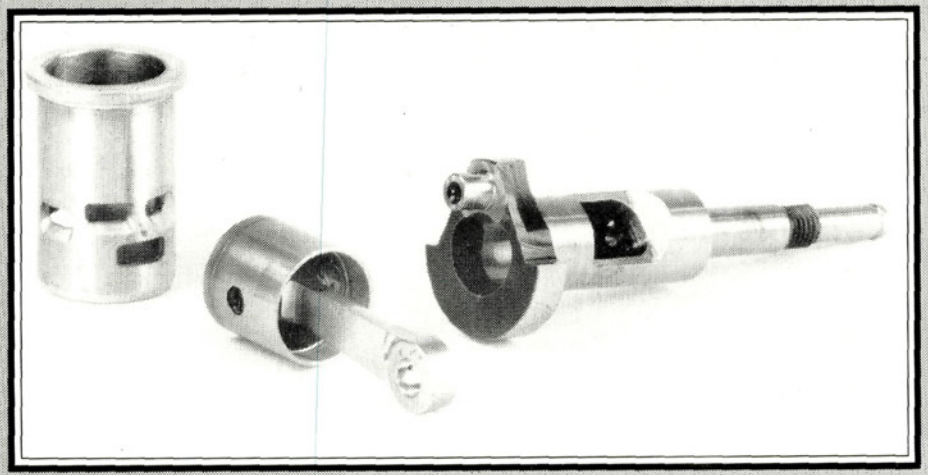
A horsepower maximum of 1.2 at 26,055rpm was almost as good as any Nova-Rossi I've ever tested. (Picco's continual experiments have obviously paid off.)

Test 2. OPS quiet tuned pipe (EFRA style): fuel/plug as in Test 1.

(Specs on next page; text continues on page 91.)



mpact plastic. The fuel adjusters are firmly "O-



Note the considerable crank-web cutaways in keeping with modern trends. The crankpin has a slanted oil hole for increased big-end lubrication. Note that the induction bore is "belled" out for increased gas movement.

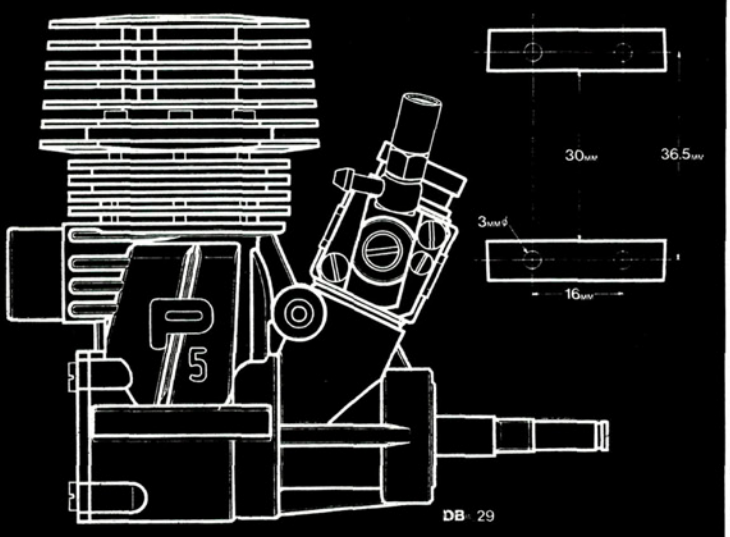
SPECIFICATIONS

Capacity	0.2118 cubic inch (3.47cc)
Bore	0.657 inch (16.6mm)
Stroke	0.6324 inch (16.06mm)
Stroke/bore ratio	0.968:1
Timing periods	Exhaust: 163°
	Transfer: 117°
	Boost: 112°
	Front induction:
	Opens: 34° ABDC
	Closes: 60° ATDC
	Total period: 206°
	Blow-down: 23°
Combustion volume	0.36cc
Compression ratios	Geometric—10.64:1
	Effective—6.67:1
Exhaust-port height	0.226 inch (5.76mm)
Cylinder-head squish	0.014 inch &.018 inch
Cylinder-head squish angle	0°
Squish-band widths	0.052 & .129 inch (1.34mm & 3.3mm)
Carburetor bore	0.35 inch (9.1mm)
Crankshaft diameter	0.511 inch (13mm)
Crankshaft bore	9.9mm reducing to 9.6mm
Crankpin diameter	0.196 inch (5mm)
Crankshaft nose thread	1/4 UNF
Wristpin diameter	0.157 inch (4mm)
Connecting-rod centers	30mm
Engine height	3.5 inches (89mm)
Width	1.73 inches (43.9mm)
Length	2.5 inches (63.5mm)
Width between bearers	1.186 inches (30.1mm)
Mounting-hole dimensions	16x36x3mm
Frontal area	5.8 square inches
Weight (overall)	9.85 ounces (280gm)

Performance:

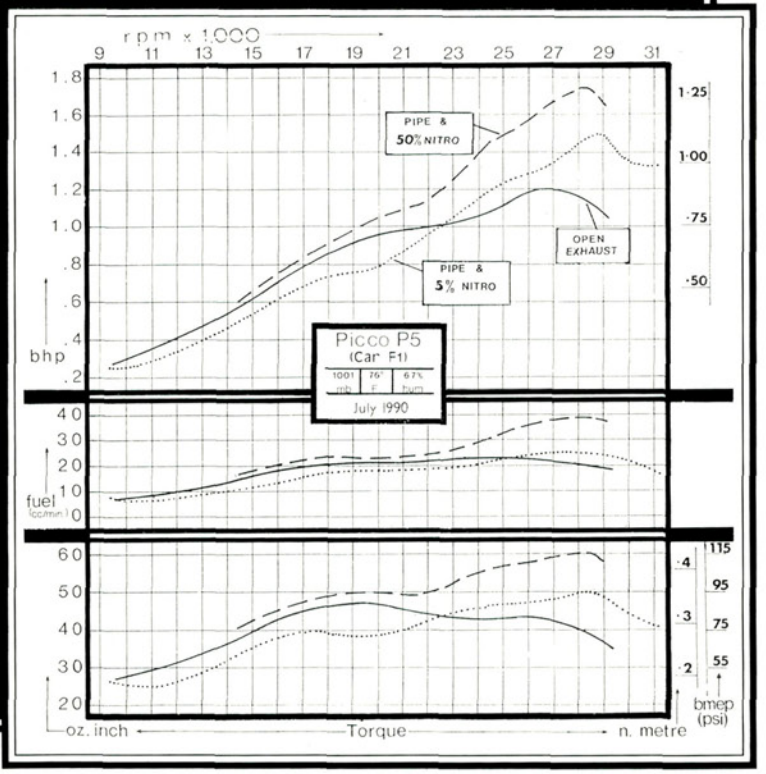
Max. BHP	1.77 @ 28,260rpm (OPS pipe/50% nitro)
	1.20 @ 26,055rpm (Open exhaust/5% nitro)
Max. torque	60 oz. in. @ 28,260rpm (OPS pipe/50% nitro)
	47 oz. in. @ 19,550rpm (Open exhaust/5% nitro)

Manufacturer: Picco, Monza, Italy.
U.S. Distributor: Tidewater Engineering,
P.O. Box 1135,
Bastrop, LA 71220.



Performance Equivalents:

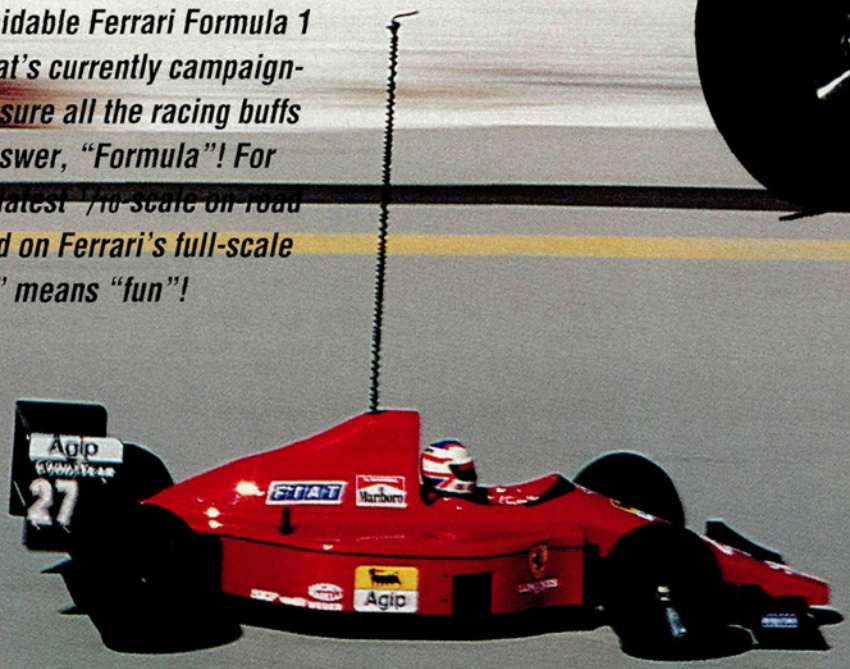
BHP/cubic inch	8.357
BHP/cc	0.51
Ounce inch/cubic inch	283.3
Ounce inch/cc	17.29
Gram meter/cc	12.4
BHP/pound	2.87
BHP/kilo	6.32
BHP/square inch frontal area	0.305



TAMIYA

FERRARI F-189

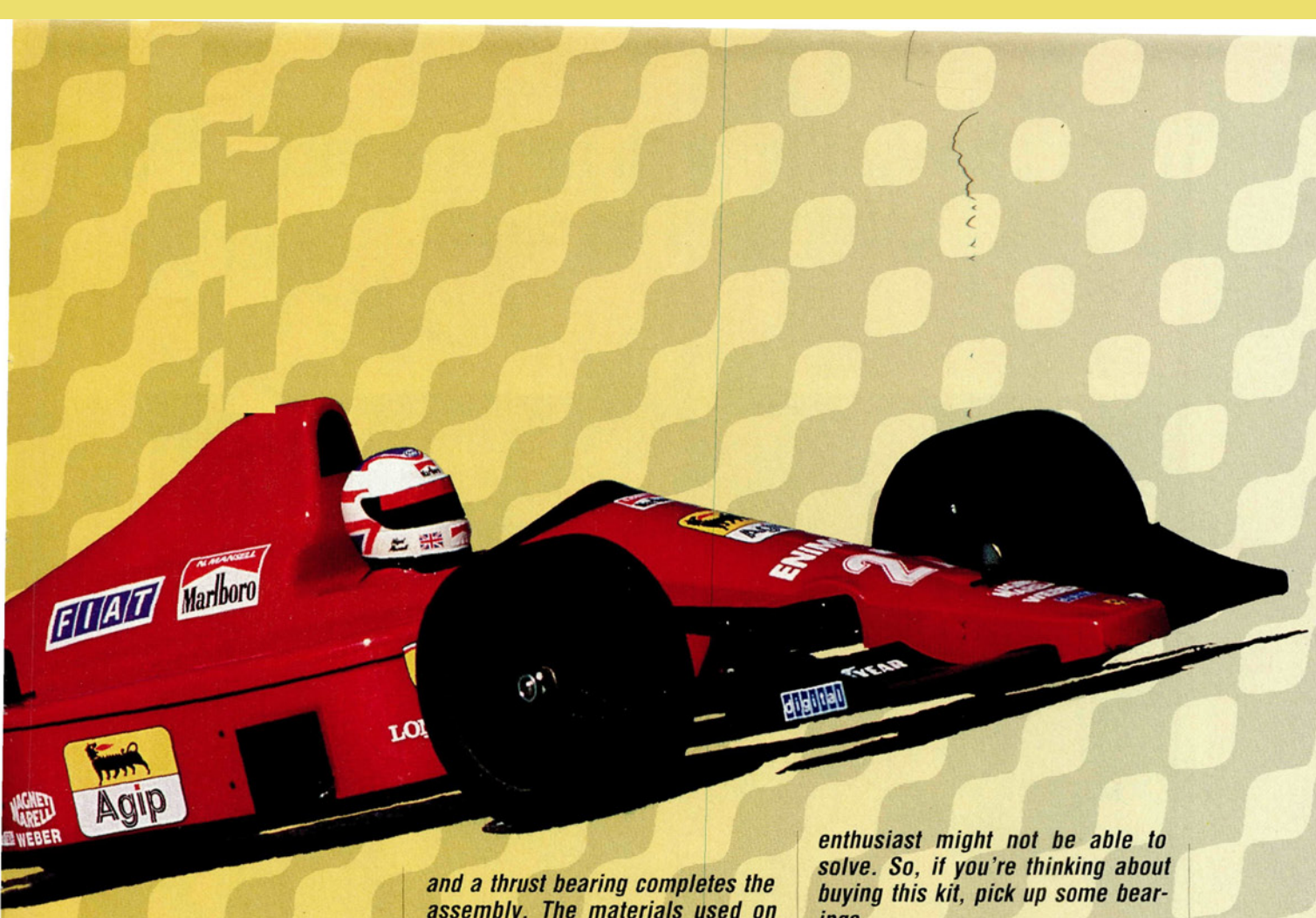
WHAT DOES THE "F" stand for in F-189? Because it's part of the call sign for the formidable Ferrari Formula 1 race car that's currently campaigning in Europe. I'm sure all the racing buffs were quick to answer, "Formula"! For Tamiya's latest 1/10-scale on-road car, which is based on Ferrari's full-scale creation, the "F" means "fun"!



The F-189 is an updated version of the 1/10-scale Road Wizard, which is a generic Indy/Formula car with an overall realistic "look," but no resemblance to a particular car. The F-189 has the distinct Ferrari F1 racer styling and many of the Wizard's chassis features.

by STEVE POND

PHOTOS BY STEVE POND



THE KIT

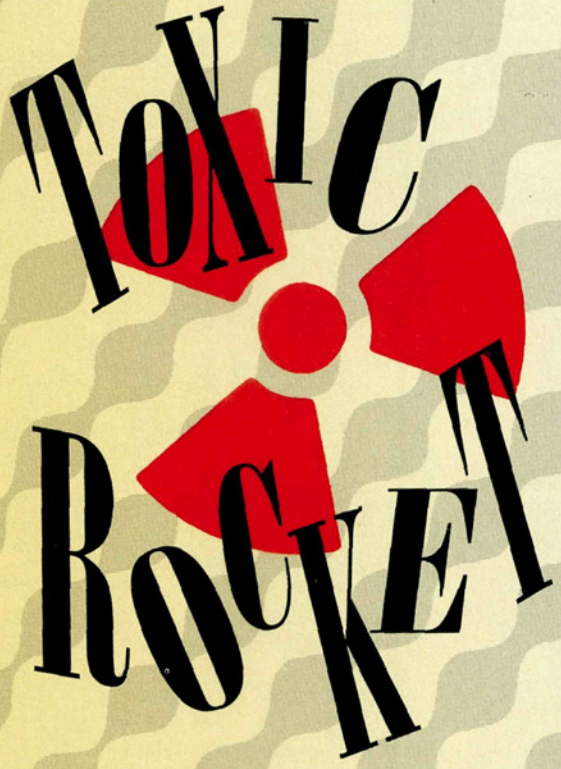
Because it has many very basic features, the F-189 is ideal for novice R/C on-road car enthusiasts, but it also has several features for those who want a scale-looking car with performance to match.

Its features include: a fiberglass-plate chassis with a T-plate rear suspension; solid, mounted, Formula 1-style, front-suspension arms with floating kingpins; a fiberglass upper-chassis plate in the rear; an oil-filled, coil-over shock that can be adjusted for a variety of track conditions; a 540 Mabuchi motor; a solid-steel rear axle; and a ball differential.

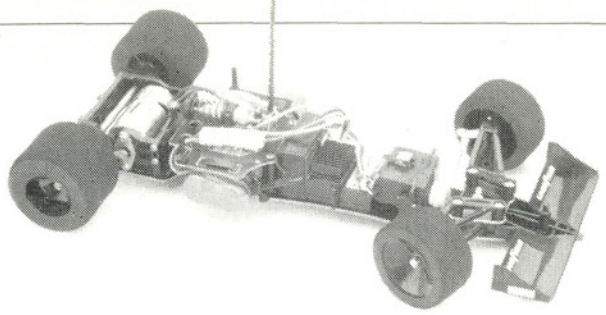
The ball diff is a new feature on Tamiya cars, and it has a great design that provides very consistent, smooth performance. Like other on-road car diffs, the F-189 has a hub that's mounted to the axle and holds one of the diff rings in place. The diff rings have a hex-shaped inner diameter (made popular in the U.S. by Team Losi), which prevents them from slipping under heavy loads and provides smooth-as-glass operation. The spur gear holds the balls for the diff, and an outer hub with a diff ring and a thrust bearing completes the assembly. The materials used on this diff aren't as precise (or as expensive) as those used on top racing machines but, with proper maintenance and adjustments, this diff's smoothness will rival those of other diffs included in some of the more expensive kits.*

The kit also includes two ball bearings and both plastic and bronze bushings (although the bronze bushings are only installed in the front wheels). For support, the rear axle uses the ball bearings, and the diff hub uses the plastic bushings. If it were my decision, the kit would include a complete set of ball bearings, but this combination is a step in the right direction. (If Tamiya has gone to the trouble to develop such a nice diff to improve the car's handling, they should think about including more bearings.)

In Tamiya's defense, if you have to use plastic bushings, the diff hub is the best place to use them. Unlike the axle and the front wheels, which usually rotate at high speeds when the car is cornering, the diff hub only rotates slightly. Ball bearings also cost more (which would make the kit more expensive), but the plastic bushings will eventually wear and cause handling problems that a new enthusiast might not be able to solve. So, if you're thinking about buying this kit, pick up some bearings.



To operate the car, you'll also need to buy a 2-channel radio, a six-cell stick pack and an electronic speed controller (ESC). In the past, having to buy an ESC would have intimidated some people because of



FERRARI F-189

its cost, but the ESC doesn't have to be a sophisticated super-high-power unit—just something simple for a reasonable price. If you want to save money, I suppose you could fit some type of mechanical speed controller in the car, but the Formula 1-style body doesn't have much space. I highly recommend that you use an electronic unit.

ASSEMBLY

In keeping with the Tamiya tradition, the F-189 includes instructions that cover *every* assembly detail.

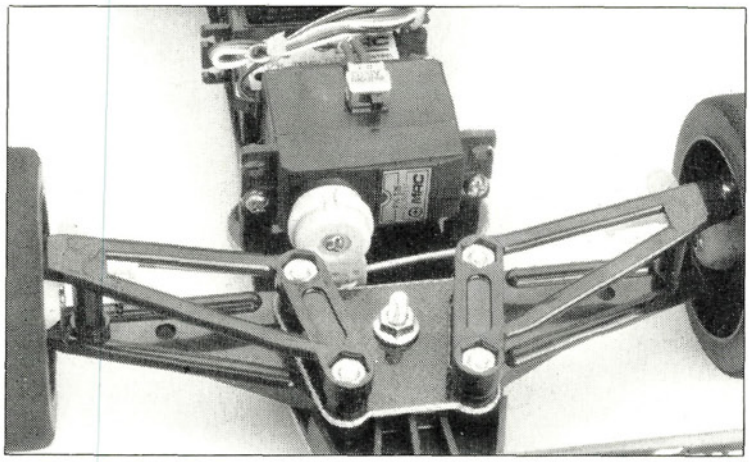
To start, mount the foam tires to the plastic wheels using double-sided foam tape that bonds the foam to the plastic. I've raced oval and on-road pan cars, and I was skeptical about this tire-mounting method (usually, I have to go through a long, messy process with toxic glues and thinners to keep the tires on the rims). I was surprised, however, by the results. If the method, which is outlined in the instructions, is properly performed, the tires stick to the rims very well and can withstand heavy cornering!

Next, the instructions outline the rear-suspension assembly, and this is followed by the rear-shock assembly and installation. The kit includes a yellow, plastic, oil-filled shock that has been around for some time. It works very well, but the plastic construction doesn't provide the precise damping that I'm used to. I installed a Kyosho* Gold aluminum oil-filled shock that was left over from a previous project. Because it's slightly longer than the kit's shock, I had to move the forward shock-mounting post, but it seemed as if the kit was designed to use the Gold shock: there was can extra hole in the chassis' upper plate that provided an ideal mounting position! (Apparently, the kit is designed to accept Tamiya's aluminum coil-over shock, which would also be a good choice if you decide to upgrade.)

To mount the bottom of the shock to the pod, I installed a Kyosho ball end, and I used a Kyosho shock bushing over the forward mounting screw for a perfect fit. So that I could use it as a standby for one of my off-road cars, I had already filled the shock with 30WT oil, but it was too light for the F-189. I refilled the shock with Team Losi's 50WT oil, and it seemed to be ideal.

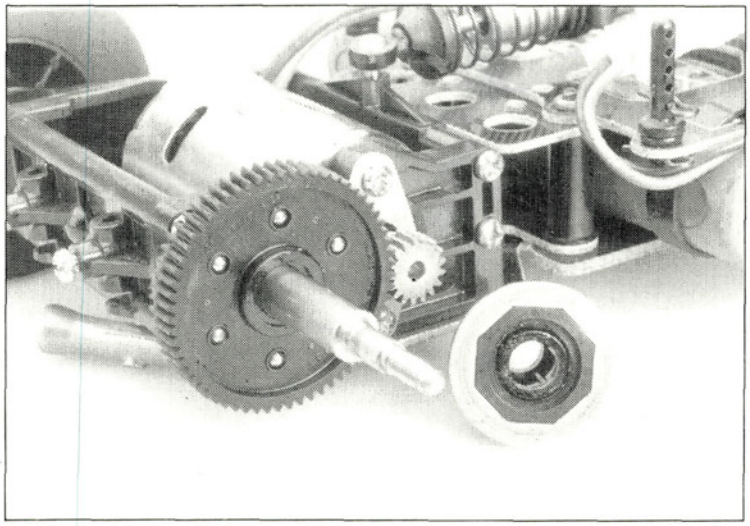
The next steps outline the front-suspension assembly and enable you to complete the chassis' construction. The front suspension features rigid, mounted upper and lower A-arms similar to those found on full-size Formula 1-type cars. Suspension movement is accomplished with a pair of floating kingpins. Despite their length and plastic construction, the suspension arms are remarkably rigid, and this allows the kingpins to absorb most of the bumps.

I used an MRC Top Gun 2-channel radio and a PK-151 electronic speed controller with reverse. The Top Gun is a low-cost radio that has just enough features to allow easy, remote adjustments. The PK-151 is also an economical unit that has neutral and high-speed adjustments and the bonus of reverse! I wouldn't consider either of these components worthy of high-speed, competitive racing, but they'll be enough for the average enthusiast.



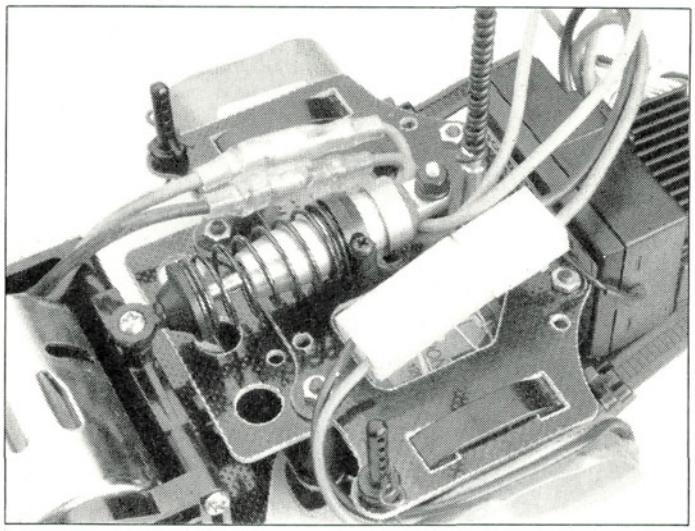
The beefy front end looks very realistic.

The final assembly steps include the installation of the motor and the diff and the painting and detailing of the body. The diff has a unique design that incorporates a two-piece axle. One part is a steel rod that passes through the bearings in the bulkhead, and the other part is attached to the drive side for the differential. Although this two-piece axle doesn't fit my philosophy of "the fewer parts the better," this design allows you to change either part if they're damaged.



The diff is extremely smooth. Note how the diff rings lock onto the hubs without the use of glue. A ball bearing can be pushed into the spur gear in place of the stock plastic bushing.

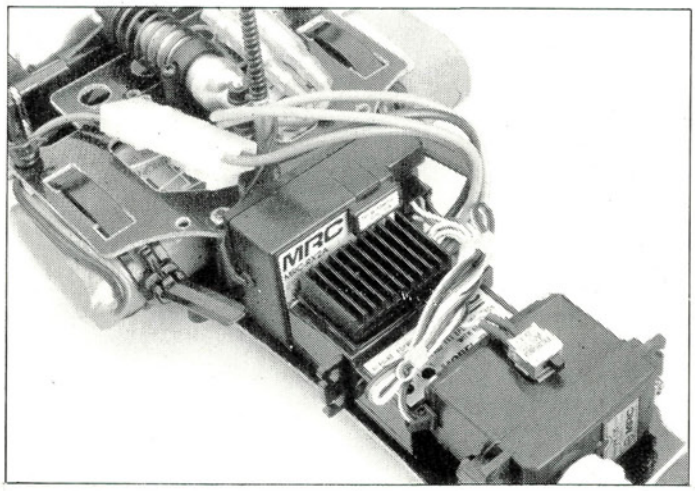
The diff has a 63-tooth spur gear and, when it's combined with the kit's 17-tooth pinion, it provides an



We replaced the stock plastic shock with a Kyosho Gold. We used 50WT shock oil when 30WT proved to be too soft.

aggressive 3.71:1 gear ratio. For the stock Mabuchi motor, this ratio provides good speed, but for hotter stock and modified motors, you'll have to use a smaller pinion gear.

Before you hit the track, you'll have to paint the body and apply the kit-supplied decals. For the body, I used Pactra's* Racing Red, and for the wing assembly, I used Pactra's Outlaw Black and Testor's* black enamel. I used



This radio system performed well and allowed full steering—even when the batteries dumped and the throttle was pegged.

Pactra paints on the inside of the Lexan body, but I painted the solid-plastic parts of the wing with Testor's enamel. Testor's enamels produce a better gloss finish (when painted on the outside), which matches the gloss on the Lexan parts of the body. Applying the decals, which are identical to those on Ferrari's 1989 team drivers' (Mansell and Berger) cars completes the assembly.

TEST

Because few adjustments are necessary, testing the F-189 was simple—not that it lacks adjustability; it's just a simple design for those who aren't up on the latest chassis-tuning tricks! I tested the car on a number of surfaces, but I'll concentrate on asphalt because, owing to the kit's nature, that's where this car will see the most action

I equipped it with a 6-cell SCR pack and ran the F-189 through its paces in an empty parking lot with a makeshift race course. The fresh surface proved to be good for the factory foam tires as I negotiated the F-189 through the turns. The ambitious 3.71:1 gear ratio took enough power away from the bottom end to keep the car under control (even with an erratic throttle finger), and it also allowed impressive top speeds on the straightaways.

I noticed a little oversteer through the turns, but that can easily be corrected by applying a little traction compound to the rear tires. On a less forgiving surface such as cement, however, the car will spin out without notice. If handling is a real concern, you'll have to use a traction aid to adjust the suspension for maximum bite. The tires that are included in the kit are made of a compound like blue foam, and

(Continued on page 164)

TAMIYA

FERRARI F-189

Type ..... On-road electric
Scale 1/10
Sug. Retail Price $135

DIMENSIONS:
Overall Length ..... 16.185 inches
Width ..... 7.870 inches
Wheelbase ..... 10.250 inches
Front Track ..... 6.589 inches
Rear Track ..... 6.112 inches

WEIGHT:
Gross (with battery) ... 3 pounds, 7 ounces

BODY:
Type ..... Ferrari F-189
Material ..... Lexan

CHASSIS:
Type ..... Pan
Material ..... Fiberglass

DRIVE TRAIN:
Primary ..... Gear
Transmission ..... Direct-drive
Differential ..... Ball
Bearings/Bushings ..... Bronze and plastic bushings; ball bearings

SUSPENSION:
Front: Type ..... Floating kingpin
Damping ..... None
Rear: Type ..... T-plate
Damping ..... Oil-filled, coil-over shocks

WHEELS:
Front: Type ..... One-piece plastic
Dimensions (DxW) ..... 1.75x1.19 inches
Rear: Type ..... One-piece plastic
Dimensions (DxW) ..... 1.45x1.79 inches

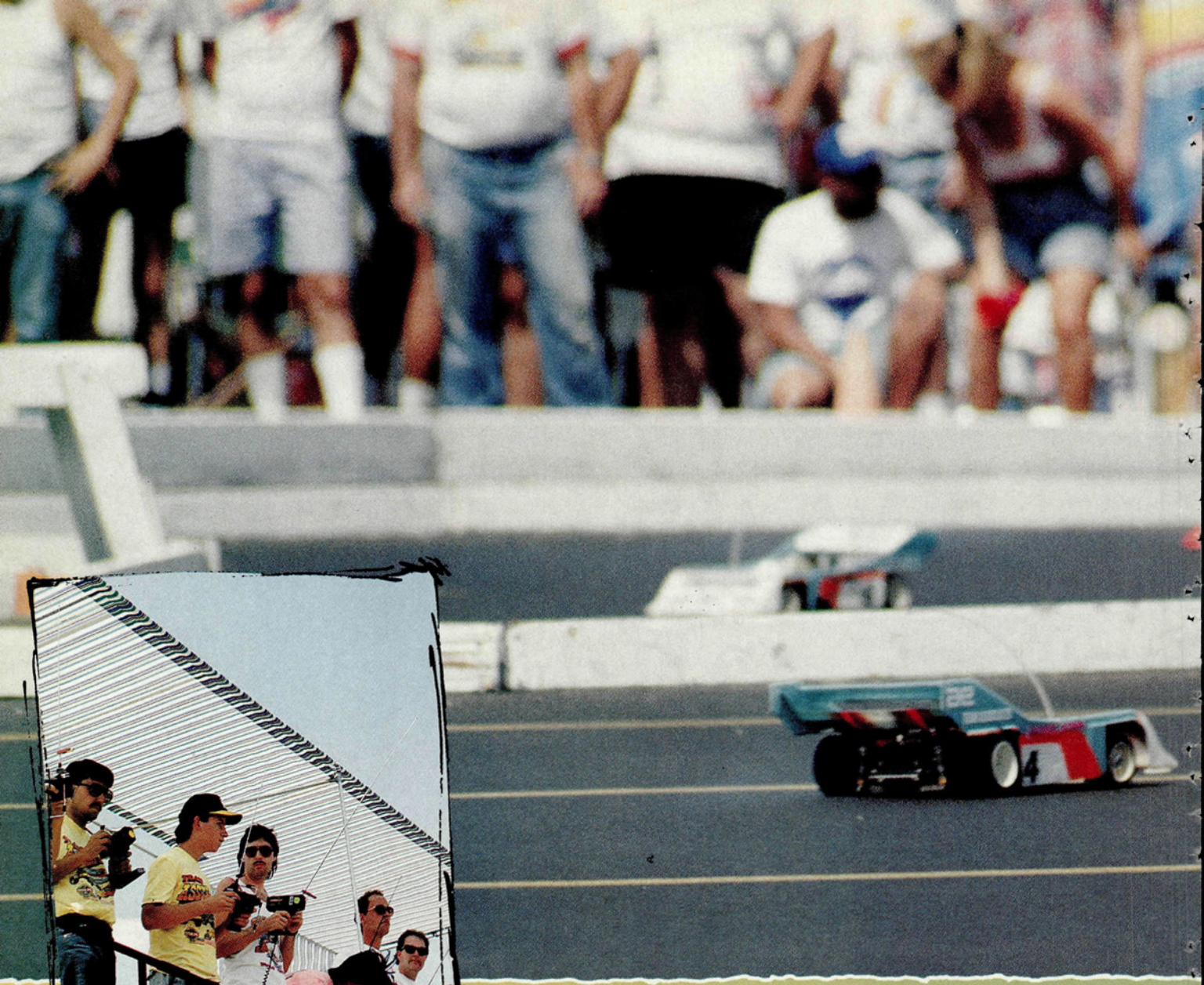
TIRES:
Front/Rear ..... Foam

ELECTRICS:
Motor RS-540S
Battery 6-cell*
Speed Controller ..... Not included

OPTIONS AS TESTED:
Kyosho Gold Shock; MRC Top Gun 2-channel radio and PK-151 ESC; Trinity SCR batteries.

COMMENTS:
The F-189 is an easy-to-build, durable machine that's suitable for entry-level enthusiasts. The power provided by the supplied motor is tame enough to keep the car under control, yet strong enough to produce impressive top speeds. The 189 isn't necessarily suitable for racing, but it handles reasonably well and should be a lot of fun for occasional users. Because the 189 has many unique parts, you might want to order extra with the kit to prevent downtime if something breaks.

*** not included**



PHOTOS BY JIM SHEPKA

Ralph Burch continued to dominate U.S. 1/8-scale gas racing with his wire-to-wire win. His smooth driving style and intense concentration are just the ticket for these high-powered, land-based missiles.

by JIM SHEPKA

ROAR'S "TOUR OVER AMERICA" made its final stop in Dallas, TX, where some of the fastest names in racing tore up the asphalt at the 1/8-Scale Gas Nationals. The race was held in the Richardson Square Mall parking lot and hosted by the RCRC Club of Dallas, which went to great lengths to make it enjoyable. The 210-foot back straight bordered the spectator area, and this gave many first-time viewers a front-row seat to 70mph sensory overload!

In case you're new to gas racing, let's take a look at these

ROAR 1/8-S

DUSTIN' WITH COMBUSTION!

The view from the drivers' stand gives you an idea of the tight corners before the ultra-high-speed back straight. You can see some of the pit at the left.

land-based cruising missiles. Gas cars are about 22 inches long and 10½ inches wide, and they weigh approximately 5½ pounds. Their 2-stroke, .21ci glow-plug engines put out about 2hp. These engines run on nitromethane (yes, the stuff that dragsters burn!) and are capable of speeds bordering on insanity!

There are three types of gas cars:

- The 2WD pan car has no suspension, but its flat-pan chassis flexes.
- The 2WD car has a full suspension and rear-wheel drive.
- The 4WD car, also with full suspension, is the most sophisticated vehicle available—and the fastest!

CALE NATS

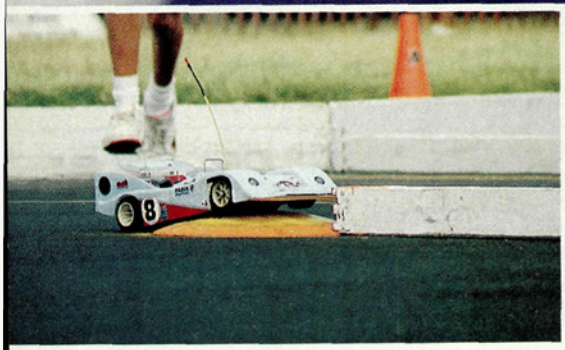
Cars await tech inspection following a heat race. Usually, a car was picked at random and inspected for weight, fuel-tank size and engine displacement.

BEATIN' THE HEAT!

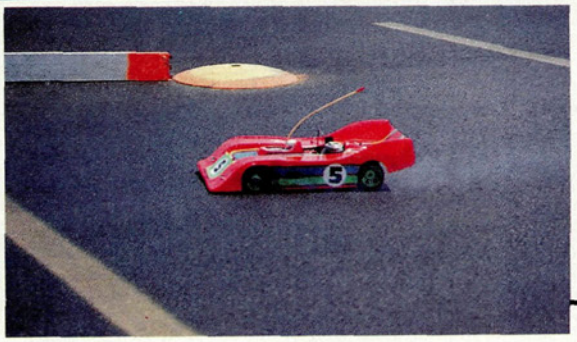
Because the track had been recently resurfaced, Race Director Bob Finley was worried that traction would be inadequate. To increase traction, the surface was treated with a mixture of sugar and water. The combination of direct sunlight and oppressive heat (temperatures were in the high 90s!) brought a thin film of oil to the surface of the fresh asphalt, and this really put drivers' chassis setups and tire combinations to the test!

On Saturday, the first rounds of qualifying took place as scheduled. As the track temperature rose to about 150 degrees, the emphasis was on driving skills. The pan cars and 2WD cars had a tough time in the later rounds. Most competitive times were turned in during the earlier qualifiers when the temperature—and the track—were cooler.

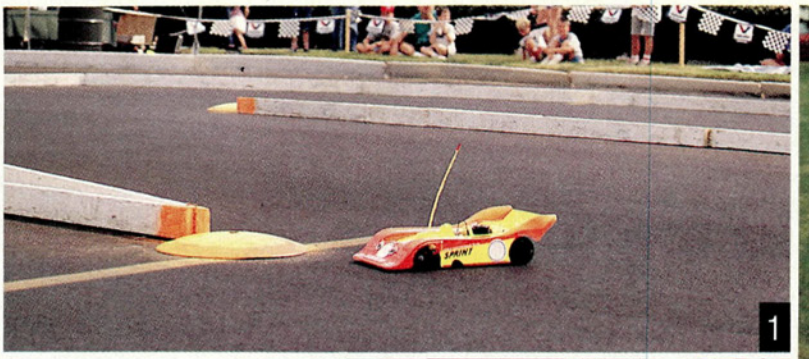
Qualifiers were set at 5 minutes with IFMAR rules in effect. After a 5- to 10-minute warm-up ses-

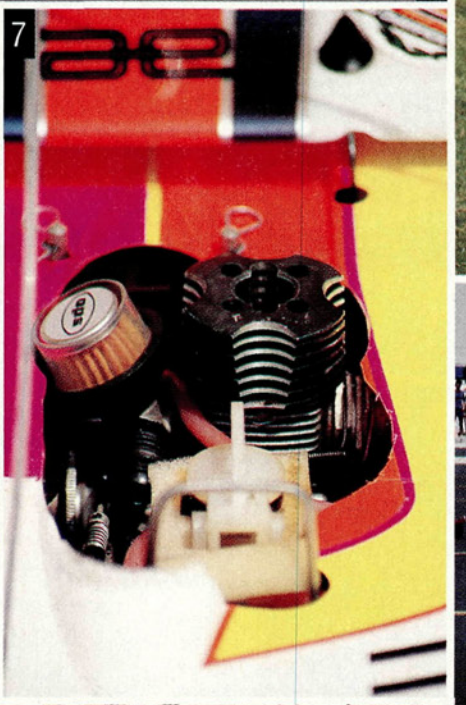


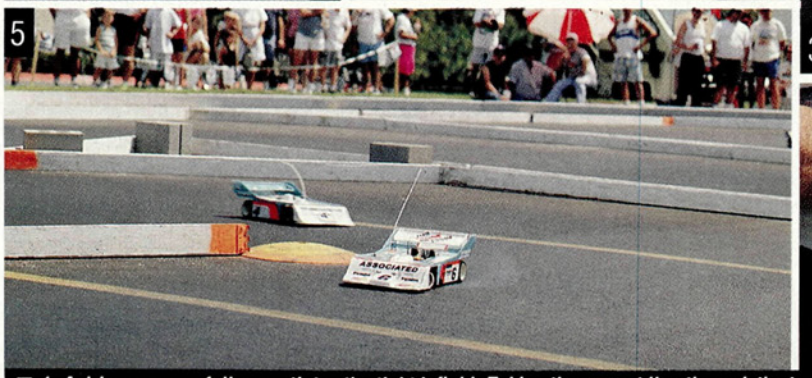
■ *This driver managed a 4-point landing and continued none the worse for wear.*



■ *The blue smoke pouring out of the headers is no cause for alarm: 1/8-scale cars use nitro-burning, 2-stroke engines!*





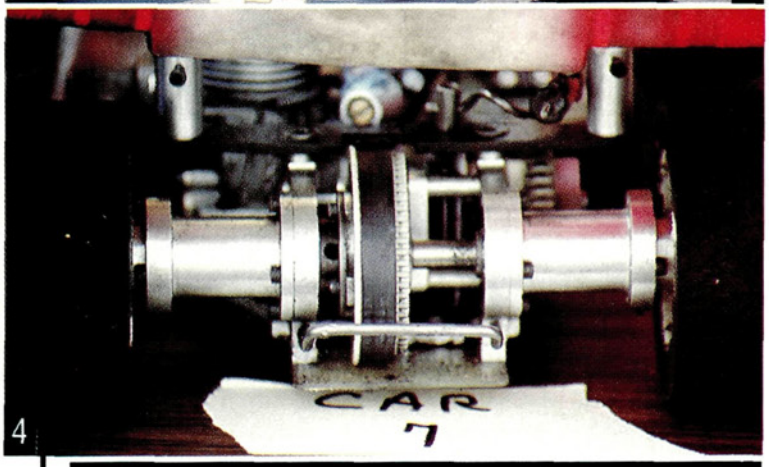


■ *1. A driver successfully negotiates the tight infield. Taking the correct line through the turns was imperative for quick lap times.* ■ *2. Bob Poage of Hadley, MA, beats the heat with the latest in R/C race wear.* ■ *3. Pit personnel are a must in gas racing. It's not uncommon to see wives and girlfriends doing the dirty work on the line.* ■ *4. A pit member hoses down a driver with a cool drink in the 100-degree heat? Actually, he's topping off the fuel tank before a qualifying run.* ■ *5. Tony Neisinger powers by the pit area in his Ron Paris-prepared ride.* ■ *6. Ron Paris's reputation in gas racing is legendary. Here, he crews for team driver Ralph Burch, Jr.* ■ *7. Burch's winning motor, which was raffled off at the end of the program.*

sion, the cars are called to the pit area, final adjustments are made, fuel tanks are topped off, and cars are given the green flag. The clock doesn't start for each car until it passes the timing tower, and each car's time is recorded separately (as in F1 racing). To the casual observer, a staggered start looks like controlled chaos, but because they're racing against the clock and not their competitors, drivers don't try to hold up the faster cars. (That's why they call it a qualifier!) The electric ranks could learn from these people!

With about 135 cars competing, there were 16 heats in each qualifying round, and this

ROAR 1/8-SCALE NATS



■ *1. A pit member awaits his driver's turn at qualifying. Fuel bottles, tires, starter boxes, stopwatches and thermal probes (to monitor engine temperature) are just a few of the items that are brought to the line.* ■ *2. "If I had known he was such a lousy driver, I never would have married him!"* ■ *3. Are we having fun yet? This guy seems to think so! Of course, it could be the combination of triple-digit heat and nitro fumes...!* ■ *4. With the incredible torque generated when racing with these small powerplants, it's imperative to have high-quality components. Aircraft-grade material and composite drive belts are the norm.*

gave the drivers plenty of time to work on their rides and tell war stories. Three rounds were scheduled for each day, so the large crowd was treated to plenty of action.

The community really came through for this event: the Richardson Chamber of Commerce, in conjunction with the RCRC Club of Dallas, showed its support. TV spots and newspaper coverage preceded the event and heightened the excitement for spectators and drivers. Second only to the famed Californian McCoy Gas Race in terms of participants, this event received great support from the local media and business community. The major sponsors—Valvoline ("Just say no to drugs!"), Electronic Data Systems (which provided the sound and PA system), Associated Electrics and Delta Airlines—were highly visible throughout the weekend.

PAN CLASS

After two days of qualifying, the Mains were posted. C-Mains and lower were scheduled for 20-minute runs, B's for 30 and the A's for 45.

After the preliminary Mains had been run, the stage was set for the A-Mains. Only nine of the top 10 cars made it to the line in the Pan Class; Mark Fuess, the 3rd-place qualifier, was a scratch after a pre-race warm-up incident. A LeMans start was used, and this added an exciting foreign flavor to the event. Pole-sitter Joe Sullivan pulled out a quick lead that was for naught; at the 9:30-minute mark, he was the first one out. A good fight for the lead developed as Dale Jones and Robert Apello swapped paint in the tight infield. Just before the 20-minute mark, Dave Fiorelli, who had been fighting mechanical gremlins, finally called it a day.

In the afternoon heat, with track temperatures of more than 150 degrees, handling and motor temperature began to affect the field, and attrition took its toll. T.J. Ahl and Sandro Tamburri dropped out before the midway mark, and the field was narrowed to five cars.

Dale Jones seemed to get the best out of his pit stops, and he started to open a lead on Apello. These two put on a good show as they pulled away from Colin Jones, David Murray and B.J. Tannehill, who were going at it for 3rd. With only five cars on the track, the drivers were able to put in some really good lap times. Jones (the 2nd-place qualifier) really began to stretch it out; he opened up a 3-lap lead over Apello and was at least 9 laps ahead of the rest of the field. At the horn, Dale Jones took the national title, followed by Apello, Jones, Murray and Tannehill.

2WD

In 2WD, all drivers made it to the grid, and after a final fuel top-off, the green flag went up. It was neat to watch the spectators take one step back in unison as 10 incredibly fast cars went hurdling down the back straight at nearly 70mph! The moves these cars made when their 2-speed transmissions kicked in were *unbelievable!*

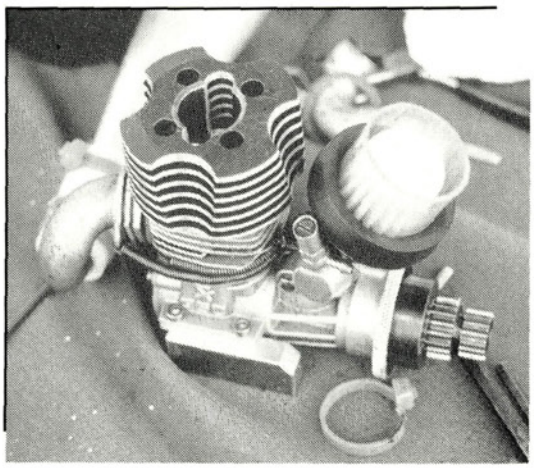
The cars were running within tenths of seconds of one another, and the lead went back and forth during the early pit stops. The slippery track conditions had little effect on tire wear (which affects the final gear ratio, motor life, fuel consumption and the overall well-being of a race car!), so the crews only had to worry about fuel. With 20- to 21-second laps being run, pit stops had to be in the 5- to 8-second range for a driver to stay in the hunt. The pit crews' hard work showed at the end of the race, as the top four cars were running on the same lap.

Skip Starkey couldn't keep up the pace of his TQ effort, and he fell back as Ralph Phillips, Jeff Bronstein, Mark Miranda and Dave Campbell went at it for the top spot. With all 10 cars running until the end, traffic was a problem at times. Scott Barrera and Phil Cotter developed handling woes and fell well off the pace. There were some anxious moments when the lead pack came up on the slower vehicles, but sportsmanship prevailed, as the back markers provided ample passing room.

The top six cars were within striking distance of one another, so the last round of pit stops could win or lose the race. Campbell came away cleanly and managed to put some distance between him and his rivals. He beat the buzzer and collected the additional lap to go one up on the field. Greg Birch and Mike Finley couldn't keep up the pace and faded a few laps back. Bronstein held on for the runner-up spot, and Miranda and Phillips finished 3rd and 4th, respectively.

4WD

More than 70 drivers went at it in qualifying. Eventually, 10 of the best shoes in the business were poised to do battle, and if qualifying times meant



Left: The Paris-Rex motors were a force to be reckoned with, and many of the top drivers used them.

ROAR administrator John Thawley tries to decide between lemon-lime and fruit punch.

P A N A - M A I N

FIN	QUAL	NAME	LAPS	TIME
1	2	Dale Jones	115	45:16.88
2	4	Robert Apeilo	112	45:22.00
3	5	Colin Jones	106	45:10.13
4	7	David Murray	105	45:05.46
5	8	B.J. Tannehill	104	45:10.41
6	6	Sandro Tamburri	55	24:25.24
7	10	T.J. Ahl	46	20:31.32
8	1	Joe Sullivan	26	19:28.32
9	9	David Fiorelli	24	19:29.96
10	3	Mark Fues		

2 W D A - M A I N

FIN	QUAL	NAME	LAPS	TIME
1	4	David Campbell	126	45:04.15
2	5	Jeff Bronstein	125	45:08.42
3	2	Mark Miranda	125	45:10.30
4	7	Ralph Phillips	125	45:19.69
5	9	Greg Birch	123	45:03.33
6	3	Mike Finley	121	45:02.78
7	1	Skip Starkey	119	45:12.49
8	10	Charlie Rabon	113	45:00.58
9	8	Phil Cotter	110	45:16.44
10	6	Scott Barrera	92	45:08.21

4 W D A - M A I N

FIN	QUAL	NAME	LAPS	TIME
1	1	Ralph Burch Jr.	140	45:00.46
2	3	Tony Neisinger	140	45:04.58
3	4	Chuch Moon	139	45:01.24
4	5	Rick Davis	135	45:02.11
5	9	Gary Soltys	134	45:06.78
6	8	David Diehl	134	45:12.43
7	10	Carl Petri	122	44:12.03
8	7	Arturo Carbonell	96	45:13.82
9	2	Robert Horan	40	13:23.28
10	6	Mike Swauger	32	13:03.95

ROAR 1/8-SCALE NATS

ROAR 1/8-SCALE NATS

anything, they were all hunting for the runner-up spot.

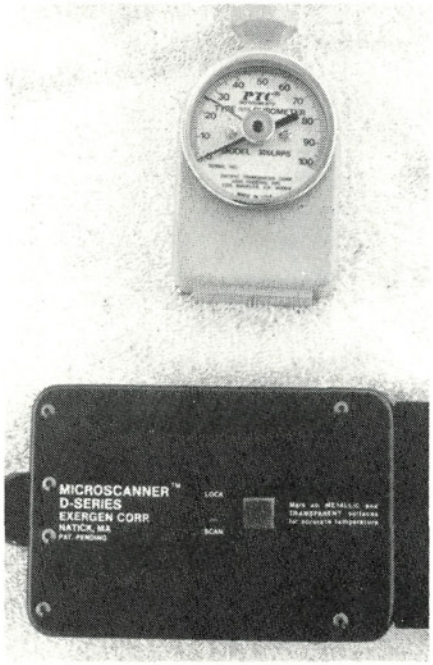
Four-wheel-drive racing always reminds me of the commercial that shows a fire-breathing German sedan travelling sideways at a ridiculous speed—only here, they were *all* going sideways! Watching these cars coming into the first turn after reaching maximum speed on the 200-foot straight is an experience that's hard to describe. The lateral G-forces would faze even the most seasoned jet jockey.

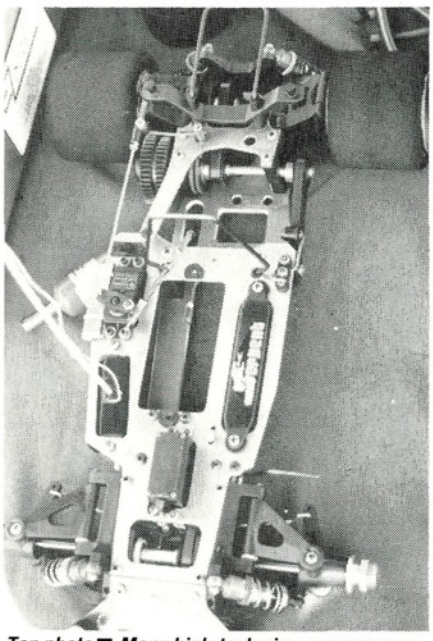
With less than a third of the race in the books, the number-two qualifier, Bob Horan, flamed out for the final time, and he and Mike Swauger were the first to park it. Two separate battles were shaping up in the rest of the field. Gary Soltys, Rick Davis and David Diehl waged their own little turf fight for 3rd, while the lead pack—pole-sitter Ralph Burch, Jr., Tony Neisinger and Chuck Moon—turned laps at a dizzying pace.

Arturo Carbonell's Picco ran into trouble and dropped way off the pace, but it managed to stay on the track and out of harm's way. Carl Petri's Serpent couldn't deal with the oppressive heat, and it, too, faded from the scene. The lead cars were still turning very respectable 17- and 18-second laps, and they gradually put the field down a few laps.

With time running out and the lap times dropping off, Dave Diehl got his act together and turned in some fast laps. Unfortunately, he was too far off the pace to make a serious charge, and he had to settle for 6th. Back up front, Burch continued to dominate this event as he had from the first qualifying round. Moon tried desperately to keep pace with Neisinger and Burch, but he finally fell a lap behind the leaders. Neisinger's patience was never rewarded, as he could only get within shouting distance of Burch. After 45 minutes of exciting racing under truly difficult conditions, the pair finished only 4 seconds apart.

The ROAR 1/8-Scale Gas Nationals (or the 1st Annual Ralph Burch Texas Massacre and Pig Roast!) is now history. It seems that 1/8-scale gas racing is alive and well and looking for bigger and better things in the '90s. With the efforts of clubs like RCRC of Dallas and dedicated racers from across the country, this segment of the R/C industry has a sure grip on its future. ■





Top photo ■ Many high-tech gizmos were seen in the pits. Shown here are a meter for measuring tire density and another for measuring temperature using infrared light. Above: ■ Three of these Serpent cars placed in the A-Main, but the RC-500s prevailed in the end.

KYOSHO

Ultima

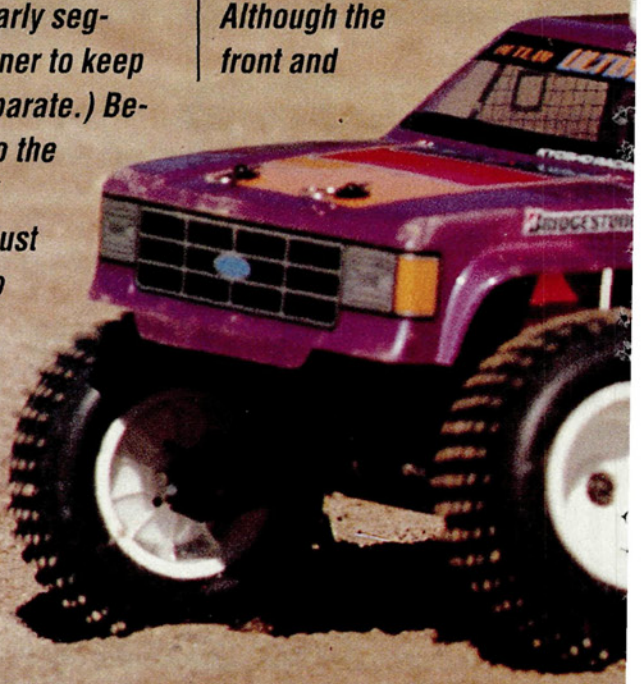
by ED BYRON

KYOSHO'S* ULTIMA OUTLAW truck is the latest adaptation of its versatile Ultima chassis. The Outlaw and all its conversions make it a contender in the growing race-truck battle. Given the popularity of the monster-truck class, Kyosho wanted to offer a durable, competitive vehicle that's also fun to drive in the sand-lot.

The Outlaw is packaged in an attractive box that has a large picture of a good-looking Ford Ranger pickup on it. The bubble pack contains the rear wheel shaft, the servo-saver shaft, the drive washer, the swing shaft, the gearbox halves, the cross wrenches and the motor plate. (Use an ice tray or a similarly segmented container to keep the screws separate.) Before I dove into the construction, I slowed down just long enough to read the instruction manual; it was straight forward and contained some good diagrams.

ASSEMBLY

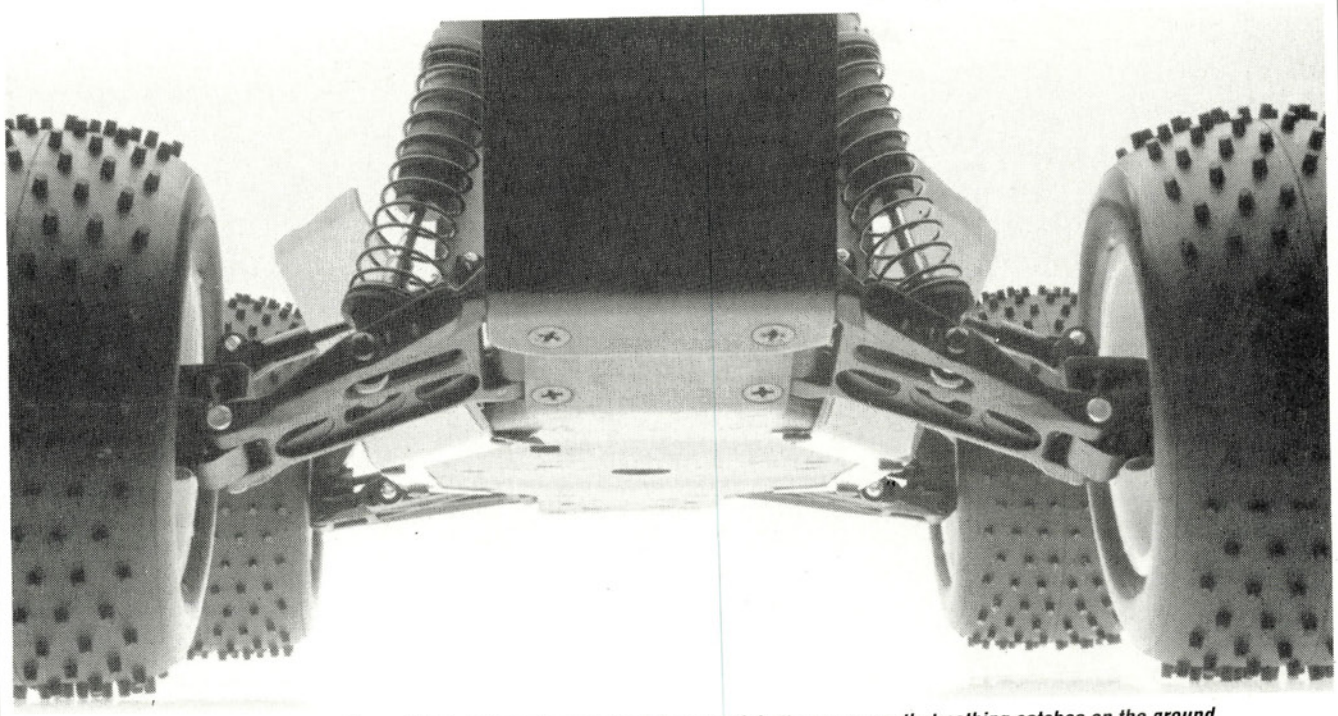
Construction starts with the shocks, which are the Ultima II's standard, black, composite shocks. Although the front and



out of control

rear shocks are the same length, the instructions call for a 12mm piece of fuel tubing to be added to the front shock shafts outside the case to limit travel. The tubing reduces the shock travel by half, but it didn't seem to hamper the front end's ability to soak up the big jumps. The adjustable spring spacer came in handy, and I wouldn't recommend that you replace it with a collar that can be tightened because the shock case may become deformed and jam the piston.

The next step is to assemble the gear-type differential. This diff will work smoothly and reliably if you take the time to file the flashing off the bevel gears. I was a little disappointed with the quality of the bevel gears: the way they came, the diff would never spin. For the best performance, remove the



Lots of ground clearance is provided with the stock setup. The smooth bottom ensures that nothing catches on the ground.

excess metal with a file.

Construction continues with the gearbox and the shock-tower bulkhead assembly, which are both attached to the Kelron chassis. This is where I realized that the chassis plate was warped. I wondered what effect this would have on performance, but that question would have to be answered later. While assembling the suspension, remember to check that all pivot points operate smoothly and to expand the holes if there's binding.

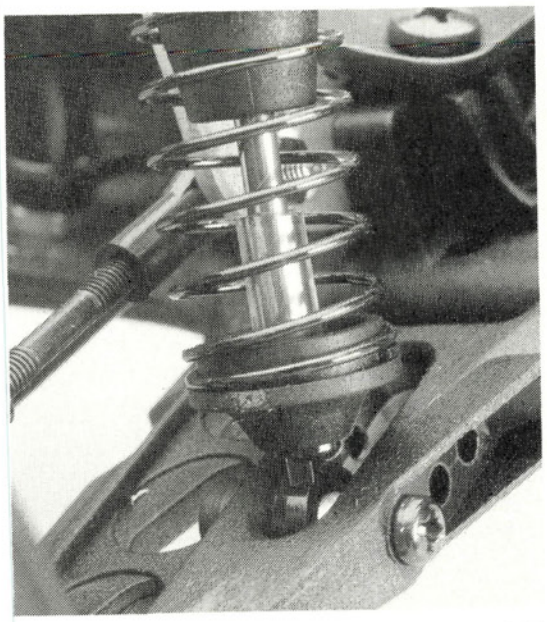
Install the steering servo in the chassis and mount the excellent rotary mechanical speed controller and servo on the radio plate. Then mount the radio plate in the chassis. I had hoped that the connection between the chassis and the radio plate would straighten the warp, but it only cured about half the problem.

On to the center gear and motor installation. The manual cautions you to check the mesh between the counter-gear and the center gear and to elongate the mounting hole by 2mm to allow the shaft to adjust for a proper mesh. The spur-and-motor-gear assembly is sealed off by an excellent gear cover.

The installation of the receiver is next, and this is followed by the tire and wheel assembly. To prevent dirt from getting into the wheels and upsetting the balance, four Lexan discs are included as inner wheel covers—a nice touch.

Finish the body and dirt guards as you wish; Kyosho provides plenty of good-looking decals. I painted the Ford body in the two-tone style of the one on the package. I applied the side stripe to the outside of the unpainted body; then I masked behind it so I could create a nice-looking paint job. To avoid overspraying, do a good job of masking the areas you don't want painted. (If you overspray, toothpaste will clean it up without marring the polycarbonate finish.)

Mount the dirt guards after you've trimmed a hole in one of them so that a stick-type battery pack can be slid through it and onto the chassis. The big black tie-wraps hold the battery in place. Mount the body, and the



The action of the long front shocks is limited by the fuel tubing that runs over the shaft, and this negates any advantage that they give.

outlaw

Type ..... Racing truck
Scale 1/10
Sug. Retail Price $229.95

DIMENSIONS:
Overall Length ..... 16.5 inches
Width ..... 11.5 inches
Wheelbase ..... 11 inches
Front Track ..... 9.25 inches
Rear Track ..... 9.4 inches

WEIGHT:
Gross (w/bat.) ..... 3 pounds, 14.68 ounces

BODY:
Type ..... Ford pickup
Material ..... Polycarbonate

CHASSIS:
Type ..... Pan with upper radio plate
Material ..... Kelron

DRIVE TRAIN:
Primary ..... Spur/pinion
Transmission ..... Gear
Differential ..... Gear
Bearings/Bushings ..... Plastic bushings

SUSPENSION:
Type (f/r) ..... Lower A-arm, upper control link
Damping (f/r) ..... Oil-filled coil-over shocks

WHEELS:
Type (f/r) ..... One-piece plastic
Dimensions (DxW) (f/r) ..... 2.2x2 inches

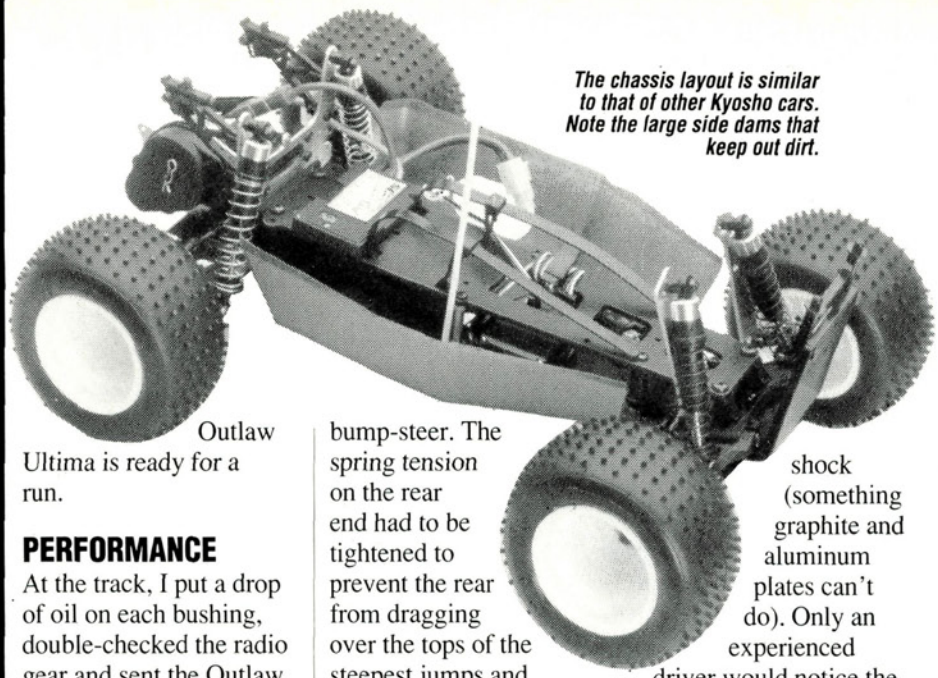
TIRES:
Front/Rear ..... Pin spikes

ELECTRICS:
Motor ..... Kyosho 34-degree stock
Battery ..... 6-cell stick or saddle*
Speed Controller ..... 3-step rotary

OPTIONS AS TESTED:
Futaba radio; FP-R102H receiver; FP-S132H servo.

COMMENTS:
This is a reliable truck with only a few faults. The chassis came warped, but this didn't seem to affect the truck's handling. The 34-degree stock motor that comes with the kit is strong enough for beginners, and the tranny can take the abuse that a modified can dish out. The bevel gears in the diff were disappointing—they had lots of unwanted flashing.

*** not included**



The chassis layout is similar to that of other Kyosho cars. Note the large side dams that keep out dirt.

Outlaw Ultima is ready for a run.

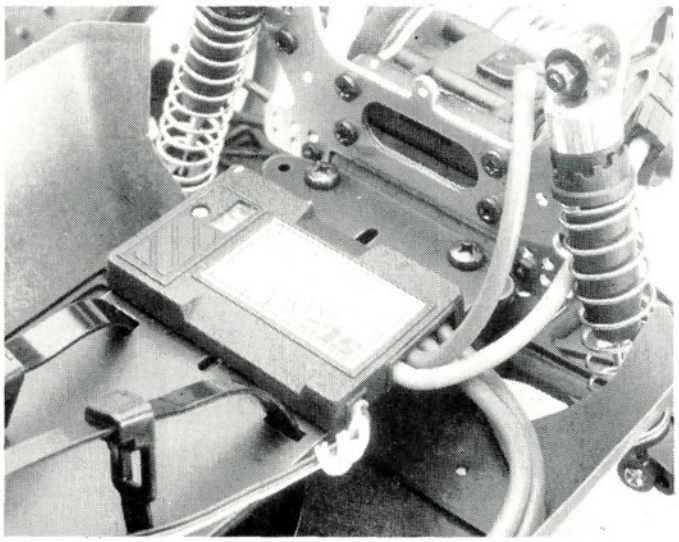
PERFORMANCE

At the track, I put a drop of oil on each bushing, double-checked the radio gear and sent the Outlaw on its first lap.

With the suspension in the stock configuration, the truck handled smoothly and predictably through turns. The Super-Stock 34-degree motor propelled the truck at competitive speeds for stock-class racing. While under power, there was a noticeable degree of understeer (good for less experienced drivers), but the Outlaw was still able to make the hairpins by swinging the rear end around with a little extra brake. Even though the fuel tubing limited the front-end travel over jumps, the nose absorbed the bumps with minimal bump-steer. The spring tension on the rear end had to be tightened to prevent the rear from dragging over the tops of the steepest jumps and sending the tail skyward.

The mini-spike tire traction was very good, and the tires' high-profile shape helped to smooth the ride over some rough terrain. The dirt guards, which looked great, worked well and kept out almost all of the dirt. The warp in the chassis plate didn't seem to affect handling. The durable, light, Kelron chassis plate is a variation of the Ultima II chassis. Kelron is a glass-fiber-reinforced plastic that's similar to the material used in A-arms and other parts. The Kelron chassis should help the suspension by absorbing some of the shock (something graphite and aluminum plates can't do). Only an experienced driver would notice the adverse effects of a slightly warped chassis. This chassis will take much more punishment than a more rigid one, and it's cheaper to replace.

The Outlaw's predictable handling combined with a wealth of hop-up parts will ensure a winning performance. As the popularity of monster truck racing continues to grow, Kyosho's durable Outlaw is ready to meet its competition.



An SCI speed controller replaces the stock rotary one. More throttle control and less wiring are two of the benefits.

**Here's the address of the company mentioned in this article:*
Kyosho/Great Planes Model Distributors, *P.O. Box 4021, Champaign, IL 61820.* ■

TROUBLESHOOTING

Illustrations by JIM NEWMAN

by STEVE POND

If you have a technical problem that your hobby shop or racing friends can't resolve, give us a shout at Radio Control Car Action, and we'll see if we can chase down an answer for you. Questions should be of a technical nature and should be addressed to Troubleshooting, c/o Radio Control Car Action, 251 Danbury Rd., Wilton, CT 06897.

BATTERY BEEF

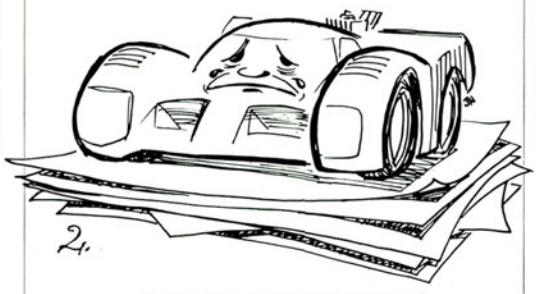
My Optima Mid is set up for oval racing. It has a Futaba MC116 SC and a 13-turn double motor. I put in an 87-tooth, 48-pitch spur gear and a 15-tooth pinion, but I can't get it to run for more than 30 seconds. I don't think my batteries are the problem because they're brand-new SCEs. Can you please help?

CORY HELMRICH
Sierra Vista, AZ

With the little information you've provided, it's difficult to pinpoint the cause of the problem, but you might be overloading the speed controller.

Check that your batteries are fully charged. (Don't laugh; your charger could be defective.) If they are charged, move on to the wiring. There could be a break in a wire, and this might be allowing current to pass through for a limited time. When current starts to flow and the wires heat up, however, the circuit may be breaking down.

If you've already eliminated these possibilities, you may have a problem with the speed controller (SC). Whether you're overloading it, or it has a defective temperature sensor, is hard to say. Without knowing your track's dimensions, I can't tell you if you're overgeared. The easiest way to check whether your SC is the cause of your problem is to install one you've borrowed from a friend and see if this solves the problem.



GET RID OF RESIDUE!

I recently bought a Cox .049 GTP, and I have trouble starting it. The directions say you should put the fuel on the ratchet when it doesn't engage, but this hasn't helped, and neither has assembling and disassembling the car several times. I've spent too much money on this car to turn it into a paperweight. Please help!

BILL PLEMMONS
Wentzville, MO

I recommend that you remove the ratchet mechanism and flush it out completely with a spray cleaner to disperse accumulated fuel residue. As the instructions suggest, there's a definite chance that fuel got inside the ratchet and gummed up the mechanism. A thorough cleaning followed by an application of light lubricant should do the trick. Another possibility is that the ratchet is broken and should be replaced. It's only a 5-minute operation, and the part is readily available from Cox.

CONTROL YOUR CONTROLLER

I've been having a throttle problem with my Blackfoot. Every time I floor it, it pauses and then speeds up. I think I might have a glitch in the mechanical SC, or perhaps the throttle servo isn't properly installed. Could an electronic SC solve this problem? I use a brand-new Magnum Sport. Can I mount smaller tires, e.g., the JR-XT's, on my Blackfoot? Your magazine helps me a great deal. Keep up the good work.

STEVEN DAUBER
Reading, PA

You're definitely having one of two possible SC problems. Perhaps you've burned out or broken the resistor that has the three wires attached to it. If the truck has only full speed, then the resistor, which is essential for the first and second speeds, has somehow been damaged and must be replaced. Another possibility is that the SC contacts are corroded or burnt. If this is the case, the truck will work in all three speeds but, as you mentioned, it will hesitate as the contacts try to pass the current through. Check the four fingers on the rotor and the four contacts on the SC plate to see whether they're seriously discolored. If they are, clean them with 400-grit sandpaper and give it another shot.

BATTERY BASHING

When I started to charge my SCR 6-cell PTI battery, the two alligator clips from my Novak peak charger touched while they were connected to my battery. The clips let out sparks, and the battery

started to emit smoke. I unplugged the charger and charged the battery again. I charged as usual, got up to regular voltage at the track, and my JR-X2 ran well during practice. Is the battery still fine? Will its life be shortened, or will run times be short?

CHRIS JONES
Sandy, UT

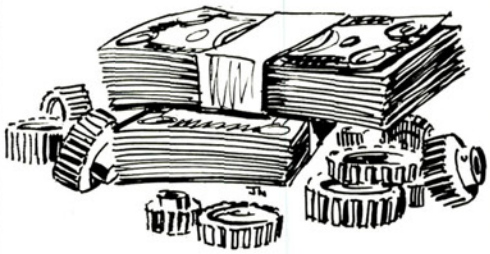
Although it isn't a good idea to short the clips together when you're charging a battery pack, you're more likely to damage your charger than your battery. SCR batteries are very tough and can withstand loads of up to 100 amps for a limited time (equivalent to a dead short). In the event of a short circuit, quickly—and carefully!—pull the clips apart (they'll be hot). As long as you separate the clips within a few seconds, the battery won't be damaged.

WACKY TIRE WEAR

I recently bought a Kyosho Big Boss, and the rear tires bow in and, therefore, wear improperly. Is there anything I can do to correct this?

RYAN BOWMAN
Reynoldsburg, OH

Because the upper and lower arms aren't adjustable, there isn't much you can do to avoid improper tire wear. The only suggestion that comes to mind is that you should check the points where the arms are attached to the chassis and the steering hubs. A loose or worn mount for the arms will allow the wheels to flop around slightly when the car is cornering. Make sure all the fasteners are tight, and if you still have the problem, and it's really important to you that your wheels wear evenly in the center, you may have to replace a couple of worn parts.



GETTING GOOD GEAR

I have a serious problem with my Tamiya King Cab: the intermediate gear that's attached to the 77-tooth spur gear lasts for only about three races before being completely stripped. My hobby dealer says that you can only get a replacement spur gear if you buy all the transmission gears that come with the kit. This puts a heavy strain on my wallet! Are there any after-market gears or permanent solutions to this problem?

ALAN WALROND
Vancouver, British Columbia, Canada

The cause of your problem is the small plastic bracket that supports the idler gear that sticks out of the transmission. When you run a modified motor, the increase in stress on this bracket causes a hairline fracture that can worsen as more power is applied and result in stripped gears. As a solution, use a Stormer Racing aluminum transmission bracket (see the Hi-Lux review in the last issue). The stronger aluminum bracket does a great deal to prevent the gears from stripping. To further avoid problems with the gears, Robinson Racing makes a cluster gear that features a machined-plastic spur gear and a machined-metal reduction gear. I've tested this setup with a 12-turn motor to see whether I could do some deliberate damage, but the gears showed no sign of fatigue. ■

DIRT DIGEST

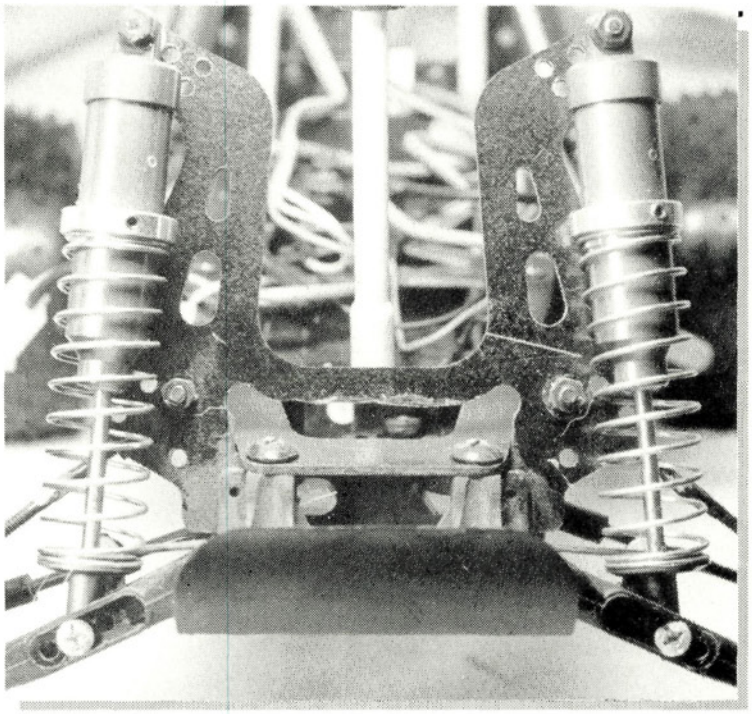
by BILL O'BRIEN & BOB KANE

Two years of doin' dirt!

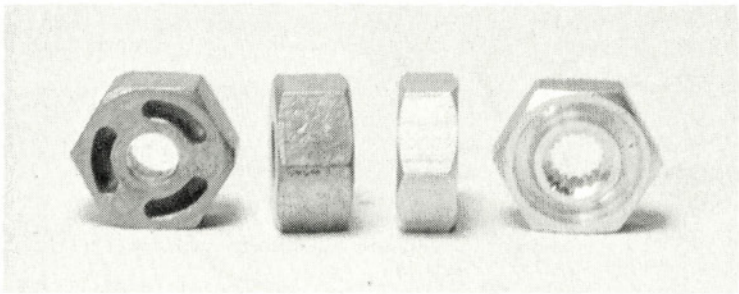
BECAUSE I DON'T keep track of time very well (I have three watches, two clocks and four VCRs to do it for me!), I was surprised to realize that this column is 2 years old. Two years! Holy smoly, Batman! You and I and, on occasion, Bob Kane have shared wit and wisdom for somewhere between 10 percent and 15 percent of the life of some of you! That's an awesome concept and an incredible responsibility.

For those who recently came onboard, I'll reiterate my R/C philosophy: I'm a builder, not a racer. In fact, I don't believe in racing in its current form. Right now if you want to race, you need a second job and a third mortgage! You have to buy all the "trick" parts you can find and hope that you don't end up racing against someone who's factory sponsored!

For me, building a car or a truck so that it makes tight turns at nearly full speed without flipping is more of an accomplishment than winning a race. Fixing a buggy's oversteering is as good as taking a trophy home. The "doing" is more important than the finishing, and if I were a racer, the *race* would be more important than the *win!*



RC10 parts are more abundant than other parts. This long shock tower found its way onto the front of an Ultima as part of a home-built truck conversion.



If you're a weight-watching fanatic, use Avante's hex-drive adapters on your King Cab, Astute, Madcap Egress, etc. They're thin and made of aluminum.

PARTS IS PARTS

When someone asks me whether he should buy the special, blue-iridium bulkhead with hyper scorch for his Yokomo, I can only ask, "Why? Did you break the one that came with it?" If the answer is "No," then why fix it if it ain't broke? If it's "Yes," then how did it break? Did the car hit a wall? Do you think it won't happen again? Save yourself a lot of money: replace it with the original part until you figure out what went wrong!

I respond in the same way when someone asks me whether he should use superlight arms (or screws, or shock towers). Will the part make you a better driver? No, because you can't buy skill. If decreasing your car's weight by 1 ounce was all you had to do to win a race, then you could just grind down the chassis and shock towers, and you'd win every time! It's better to practice and learn how to leave the line at full speed and how to avoid ending up in a first-turn pile!

RADIO DAZE

The same philosophy applies to radios. I'm a gadget man; the more flashy something looks, the more I want it—whether I need it or not! (That's why I bought my Futaba* 2PD and the JR* PCM pistols.) When someone asks me whether he should buy a Futaba 3PD PCM radio for a Clod Buster, though, I want to know why they let him out of the loony bin!

PCM systems are very resistant to interference. Because they use pulse-code modulation (PCM), very little gets between the radio and the receiver. You shouldn't operate 1/8- or 1/4-scale gas cars with anything less than an FM radio, but even that's a concession, because PCM inherently suffers from less interference than frequency modulation (FM)—but using a PCM to operate a Clod Buster?! "Oh, look! My Clod is racing away, out of control at almost 12mph! Oh, how can I catch it?" You could run backwards on your hands and catch it!

If your radio has serious interference problems, check its installation before you buy a more expensive system that might not solve the problems. If you're sure the installation is correct, and you still have problems at your local track, talk to the manager. Overhead power lines can cause interference, even on FM radios.

(Continued on page 78)

I knew some folks who had a track (of sorts) by a reservoir. They had intermittent glitching, and they tried everything to solve the problem. They put more capacitors on their motors than I've ever seen, and they even put ferrite beads on the servo leads—nothing worked! They eventually moved, only to discover later that electric relays at the reservoir caused their problems. A PCM system would have helped, but it was more expensive for 10 guys to buy PCM radios than it was to move.

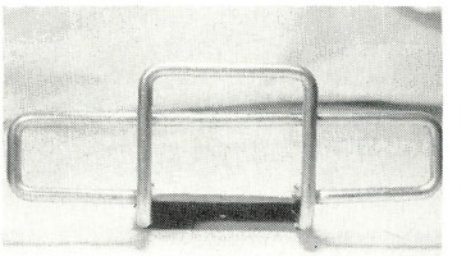
Not all problems can be solved by throwing money at them. If you think they can be,, you probably think that you can get the same batteries as the factory drivers; and if you believe *that*, I'd like to talk to you about a bridge...!

Some of the extra stuff is important (e.g., an aluminum front bumper for a Blackfoot). When we play with our cars, we can get a little rough. After all, many of us are "smuggies" (Stupid Middle-aged Underachieving Guys), and we're more interested in having fun than competing. Given that premise, you can understand why an aluminum front bumper is beneficial. I found one from Pro-Track*, but I was uneasy about using it. (I had also bought Pro-Track's aluminum roll bar, and the first installation instruction was to "Ream and tap the holes." I don't do that when I pay $20 for something.) The bumper looked better, and could be installed just like the original, and now Bob is looking for one for his High Roller (good luck!).

Also in the "good-to-have" category are Bru-Line* Super System wheels.

Even on the Blackfoot, you can use a variety of wheels and tires—from 2-inch-diameter Bru-Lines with Pro-Line tires to HPI wheels (shown here with the original Blackfoot tires). Trinity's Baja series is another good choice.

(Did you know that you can put Clod wheels on anything?) Bru-Line has wheels and an assortment of hubs for almost every vehicle. Their regular wheels are all 2 inches in diameter and can be mounted using the same variety of hubs. Although most truck tires are



It's really pretty, it replaces the original perfectly, and it's sturdy! Why wouldn't you want to use Pro-Track's aluminum front Blackfoot bumper?

aimed at the 2.2-inch bunch (the legal minimum for racing), Pro-Line's* truck tires (in the red and blue boxes) fit Bru-Line's 2-inch wheels.

KYOSHO TRUCKIN' BLUES

So, you own an Ultima and now you want an Ultima Outlaw truck because Kyosho* just released one. That sounds familiar, but there's an easy way to make the modifications: buy four HPI* Star Wheels with universal hubs (they come in outrageous colors), Trinity* Clod shocks (they come in packages of four), four truck tires (I put Trinity baby pins in the rear and ribs up front), three TRC* body posts and a long, front, RC10 shock tower (don't laugh; you'll have to carve it a little for the radio plate, but it will work). Stir briskly, and add the body of your choice (I liked Associated's* Toyota Baja truck body)!

Oh, you could also buy a Pro-Line or a JG* truck conversion but, sometimes, experimentation is better. I also added Du-Bro* turnbuckles to my Turbo Ultima (adjusting the monster truck wheels without them is a pain), but I think I have the world's only *turbo* Ultima Outlaw. (Use a Parma* Blackfoot body, and tell your friends it's a Stealthfoot!)

TAMIYA BAD STUFF

If you're *really* concerned about weight, the original aluminum hex adapters from the Tamiya* Avante's axles fit the Astute, the King Cab, the Mad Cap and the Egress. They're lighter than the steel adapters. (My local hobby shop had an Avante 2001, but I couldn't bring myself to buy it—hey, the year's young!)

Sassy Chassis'* aluminum King Cab chassis is a weight saver, but if you buy it (and you should, if you use your King Cab a lot), get Sassy's steering bellcrank, too. It works better than Tamiya's stock steering system.

WHAT'S UP?

See all the stuff I've saved up while working on the last dozen columns? Can I help it if I'm working on a combination Marui Big Bear/CJ-7/Clod Buster with 2WD? Is it my fault that work on my Orange Blossom Special locomotive on a tank chassis is still in progress? I mean, I'm a busy guy, right? Hellllppp!

Actually, I'm tired of trying to come up with things you might be interested in: what do you want to know? I'll fill you up with motor and battery theory in the next two or three columns, but after that, I'd like to write about something *you* want to know about. So like, you know how to write, and maybe you have 25 cents for a stamp, and there's a mailbox near you.... I wouldn't want you to go to a lot of trouble!

**Here are the addresses of the companies that are pertinent to this article:*

Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.*

JR Propo Radio; *distributed by Hobby Dynamics, P.O. Box 3726, Champaign, IL 61826.*

Pro-Track, *9320 Bechtel Rd., Elyria, OH 44035.*

Bru-Line Industries, Inc., *P.O. Box 3786, Center Line, MI 48015.*

Pro-Line USA, *P.O. Box 456, Beaumont, CA 92223.*

Kyosho; Great Planes Model Distributors, *P.O. Box 4021, Champaign, IL 61820.*

HPI, *22600-C Lambert, Ste. 904, El Toro, CA 92630.*

Trinity, *1901 E. Linden Ave., Linden, NJ 23235.*

TRC, *P.O. Box 1058, 2211 Charter St., Albemarle, NC 28002.*

Associated Electrics, Inc., *3585 Cadillac Ave., Costa Mesa, CA 92626.*

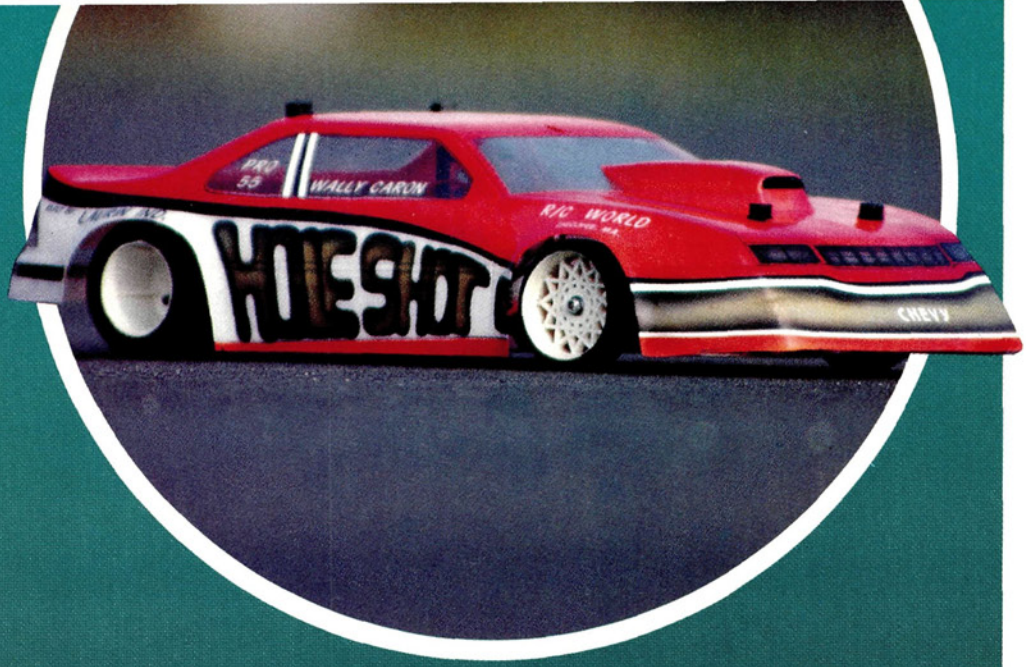
JG Mfg., *P.O. Box 6014, Whittier, CA 90609.*

Du-Bro Products, *480 Bonner Rd., Wauconda, IL 60084.*

Parma International, Inc., *13927 Progress Pkwy., North Royalton, OH 44133.*

MRC/Tamiya, *200 Carter Dr., P.O. Box 267, Edison, NJ 08818.*

Sassy Chassis, *204 South Oak St., Itasca, IL 60143.* ■



by JIM SHEPKA

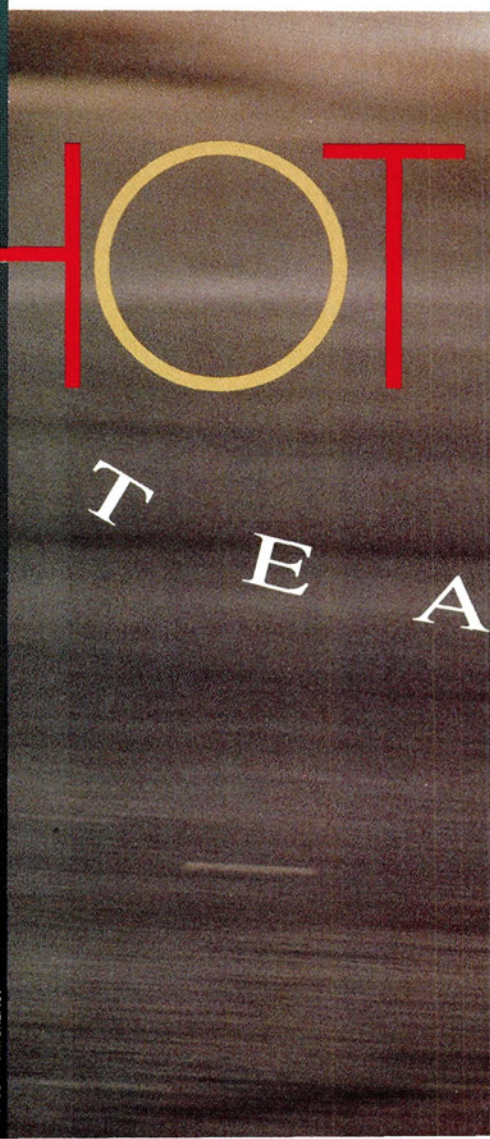
HOLESHOT

HOLESHOT—Norm Ladue and Wally Caron conceived the basic idea for this new car after watching videotapes of a top-fuel rail in action. They examined the burnout stage and the subsequent run in slow motion, and they noticed that the chassis flexed like a bow ready to release its deadly arrow. Were 2,500 ponies wreaking havoc on the drive train, or was this an intentional design feature? With more questions than answers, Ladue and Caron set out to see if this design could be used in scale.

One of the problems suffered by scale rails (and pan cars, in general) is "torque steer." Realizing this, more and more pan car manufacturers are producing cars with center-mounted motors (e.g., the Twister* Cyclone and the CompositeCraft* Lynx II). This center-mounted design puts the weight of the motor in a neutral position, and this allows the differential to transfer an equal amount of power to both tires. It's much easier to compensate for chassis tweak when most of the vehicle's weight is centered.

In 1/10-scale pan-car racing, you can adjust the differential to some degree to counter the effects of "torque steer." A little slippage is required to make a smooth transition from stop to start. Unfortunately, in 1/10-scale *drag* racing (where 2-second runs are now commonplace!), any diff slippage, and the race is over before you leave the starting line!

Locking up the differential and loading all the power to one side of the car can sometimes have hazardous effects on life, limb and equipment. When high-speed runs are made in less than 3 seconds, "pedaling" (or feathering) the throttle to retain



PHOTOS BY JIM SHEPKA

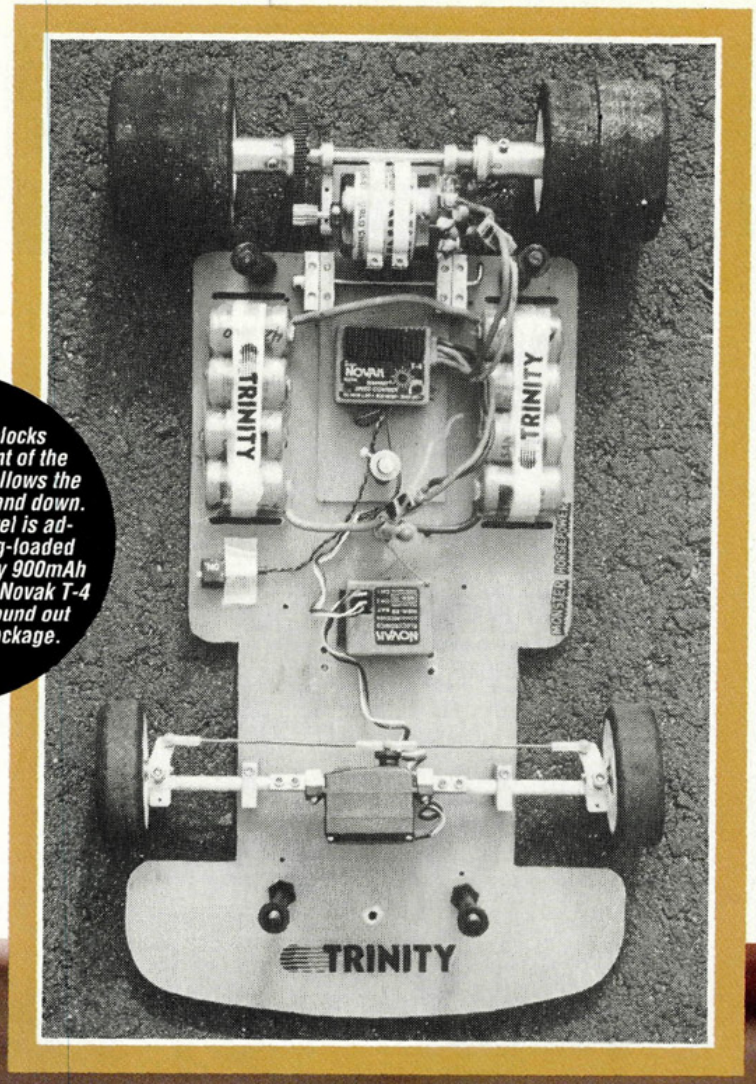
straight-line stability isn't the answer. If you want your car to launch straight, balancing the onboard equipment is critical.

This is all too complicated for me! I admit that I thought any "motor head" could get a vehicle to run fast in a straight line, but it just isn't so!

HOLESHOT HITS THE DRAWING BOARD

With a clean sheet of paper and a general idea of what they wanted to achieve, Norm Ladue and Wally Caron set out to design their own car. Because they decided to base the design around the popular Pro-Stock Class, certain requirements, e.g., the specified wheelbase, had to be taken into consideration. The car had to have a full body, a maximum of 14 cells and a minimum weight of 42 ounces.

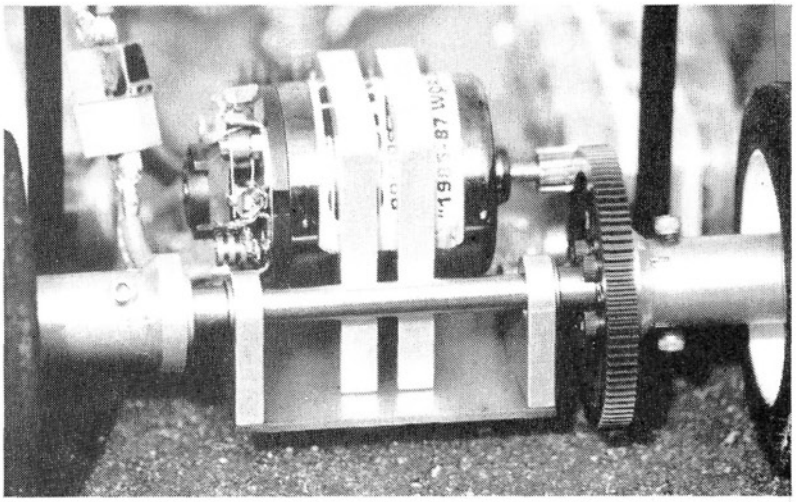
By moving the fore/aft T-plate pivot point, Ladue and Caron were able to achieve the desired chassis flexing mentioned earlier. To control the amount of flexing, they installed a center post with a spring and a collar at the front end of the T-plate (see photos). You simply move the collar upward (for



Note the pivot blocks and pin just in front of the motor. This setup allows the T-plate to move up and down. The amount of travel is adjusted by the spring-loaded center post. A Trinity 900mAh 8-cell SCR pack and Novak T-4 speed controller round out the electronics package.

more flex), or downward (for less).

To allow motor centering for optimum balance, they added a custom-built motor mount and axle carrier. From bar-stock aluminum, they made an axle and custom hubs, which they mated to a solid, pinned differential gear—the ultimate in direct-drive application.



Lightweight axle carriers, motor mount, axle and hubs are custom-machined from aircraft-grade aluminum. The motor mount is adjusted by four screws that run through the bottom of the chassis.

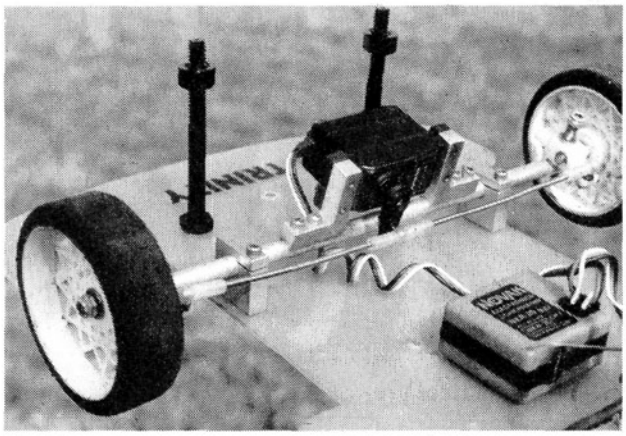
Next came the internal guidance system: a Novak* NER-2s receiver and a T-4 speed controller; and a Trinity* "Big Daddy" motor and a 900mAh, 8-cell SCR pack to provide the ponies. When the electronic package was in place, Norm and Wally headed to the test track. With the tires trued to exacting specifications and the car balanced to a tee, initial results were encouraging. The true test, however, would come during *real* competition.

HOLESHOT HITS THE ROAD

K&N Speedway in Stafford Springs, CT, was the Holeshot's first stop. With the strip in perfect condition and the timing lights in place, Wally made the first all-out pass with a very hot motor. It wasn't pretty, folks! In the real world, there would have been few survivors. The Holeshot left the line in a *big* way, but fortunately, the "Jersey barriers" kept spectator liability to a minimum!

By viewing a videotape of the run, they saw that the car had lost traction halfway down the strip and "smoked" its tires. Since it's nearly impossible to pedal the throttle, the car rocketed off track.

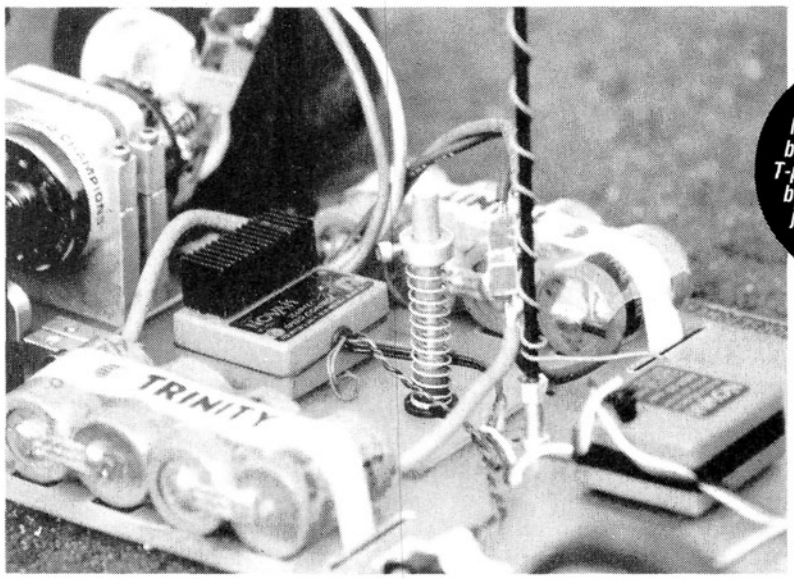
Through the dedicated efforts of its crew, the Holeshot was repaired in a little more than an hour. The chassis was set for additional flexing (more traction), and this time, results were positive, although not quite as explosive as on the first run. Once Wally had become more comfortable with the car, they tried various motor and gearing combinations and different flexing points.



A solid front axle was made from bar stock aluminum. Angle brackets were made so that the steering servo can be mounted on the top of the axle (i.e., front steer).

I'm not sure whether this design is more effective than others that are currently available, but I'm impressed with the imaginative approach used for this project. Drag racers have always been a breed apart. If they think an advantage can be gained, they say, "Why not!" After all, who shoots for 2nd place?!

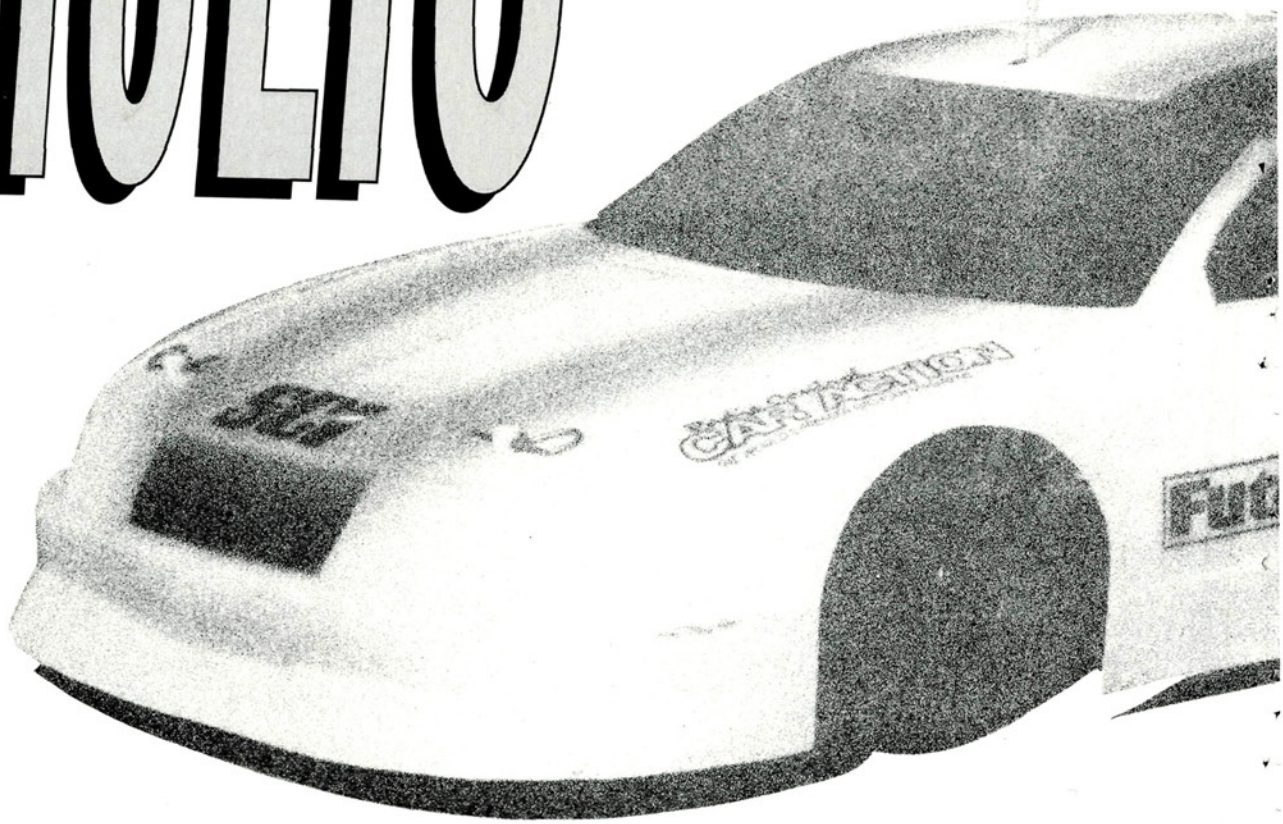
**Here are the addresses of the companies mentioned in this article:*
Twister Motors, *657 E. Arrow Hwy., Suite H, Glendora, CA 91740.*
CompositeCraft Inc., *5885 Lake Hurst Dr., Orlando, FL32819.*
Novak Electronics, Inc., *128-C E. Dyer Rd., Santa Ana, CA 92707.*
Trinity, *1901 E. Linden Ave., #8, Linden, NJ 07036.* ■



Note the spring-loaded center post behind the antenna. T-plate movement can be controlled by adjusting the locking collar.

10LTO

by JOHN HUBER



CONVERT THE 10L FOR OVAL RACING!

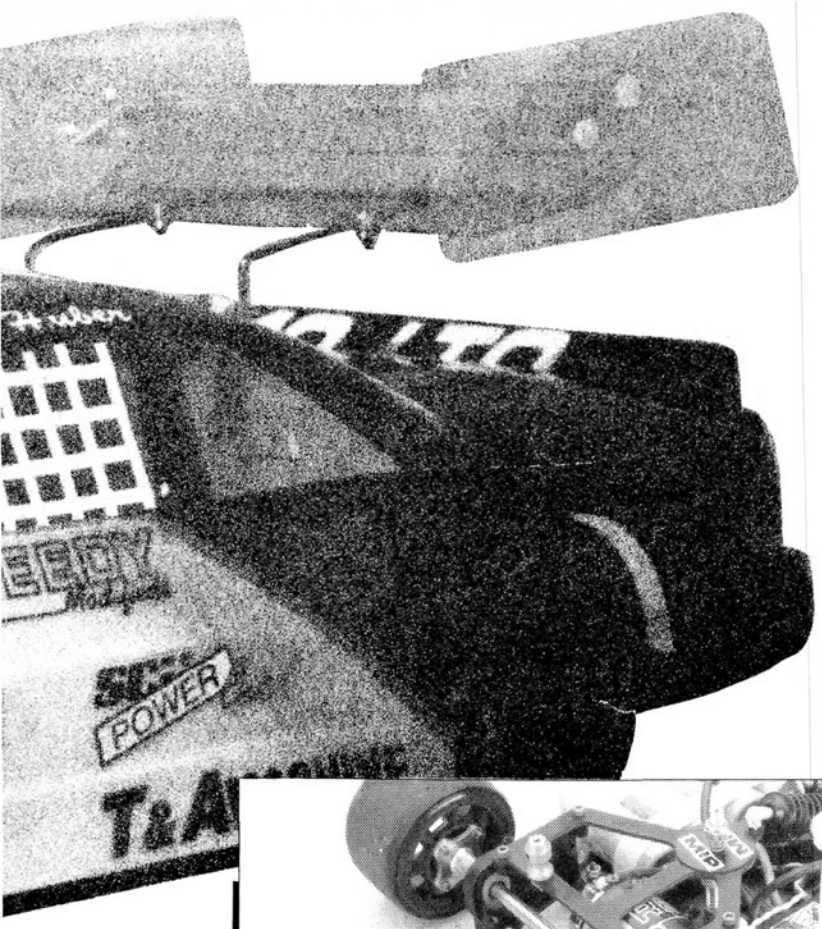
MANY WHO RACE on flat ovals offset their batteries for a left-side bias, which makes sense, since the car will be turning in only that direction. Until recently, batteries were mounted in a four-and-two or a five-and-one configuration for flat-oval racing. Now, the trend is to mount all six batteries on one side of the car for a full, left-side bias.

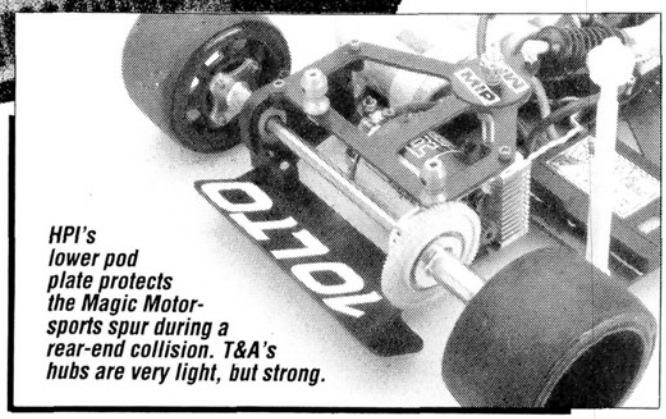
Bolink was the first company to release an "LTO" (left turn only) chassis for its Eliminator. After successfully introducing an offset chassis for its Lynx II, CompositeCraft* produced an offset chassis with matching parts for the Associated* RC10L. This chassis, which is similar to that of the Lynx II, is made of the same high-quality graphite as the Lynx II, and the matching parts include upper and lower pod plates, T-bars and a front-end brace. On my RC10L, I used all these parts, except for the lower pod plate.*

On a recent trip to California, I discovered an interesting part for the 10L. Hobby Products International (HPI) makes a lower pod plate that has about a 30-degree kick-up off the rear end and is extended on the diff side to protect the spur gear in a rear-end collision. HPI also claims that there's a ground-effect advantage, but I'm not sure of that yet. I've*

LEFT TURN LEFT TURN LEFT TURN

LEFT TURN LEFT TURN LEFT TURN

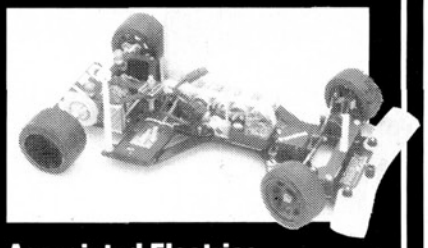




HPI's lower pod plate protects the Magic Motorsports spur during a rear-end collision. T&A's hubs are very light, but strong.

PHOTOS BY John Huber & YAMIL SUED

PARTS LIST



Associated Electrics
- Heat-sink motor plate
- "Mr. E's" 13-turn triple motor
- SCE World Pack

CompositeCraft
- 10L offset chassis
- Front-end support
- T-plate
- Upper pod plate

Futaba*
- 3PB PCM radio with S135 servo

Hobby Products International
- Lower pod plate with kick-up

MIP (Moore's Ideal Products)
- .56-inch hard shock bodies

SCI
- Power Card 1000

T&A
- Hardened-aluminum 4/40 screws
- Superlight wheel hubs
- Titanium axle

Team Losi
- 48-pitch pinion gear

TRC*
- Red dot radials

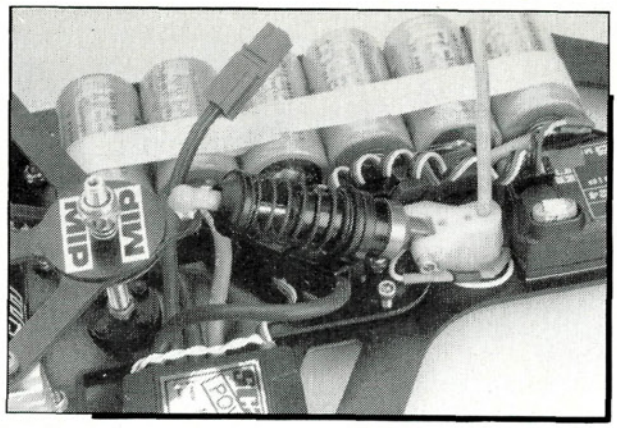
Trinity*
- 48-pitch spur gear

seen similar kick-ups made of polycarbonate that have fallen off in a crash.

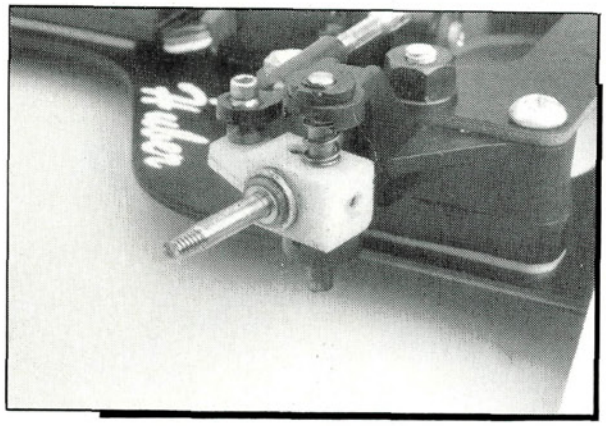
The 10L's front-end brace is mounted using all six of the front suspension mounting bolts to produce a solid front end. (The brace on the original version was mounted using only two of the bolts.) The hole in the center of the cross-brace is for a third, front, body mount or for a transponder mount. A third body mount increases rigidity and helps to prevent the wheel wells from cracking.

I wasn't satisfied with the front axles or the kingpins, so I made my own with a set of titanium RC10 hinge pins cut to the proper length. For the axles, I wanted to secure the wheels with a locknut instead of with an E-clip, so I had to cut threads on one end

(Continued on page 86)



Right: For ultra-smooth damping, I use MIP's new, hard shock body and Associated's hard-chromed shock shaft.



Left: These setscrews hold the kingpins and the axles in place. A flat spot on both ensures that they won't move.

of the hinge pin. This is easier said than done because titanium is hard, and it took time to cut just a few threads. You have to cut the threads very slowly, and you'll need a good vice to hold the axle firmly when you cut them.

To fit the bearings, I had to reduce the diameter of the hinge pins by a few thousandths of an inch so that they measured 1/8 inch. This was easily done by turning them in a drill and lightly sanding them with fine sandpaper. The kingpins' diameters were also a little too large, but this wasn't a problem because the holes in the arms had already become enlarged during normal use. Securing the kingpins to the steering blocks was much easier with the setscrew than it had been with the stock E-clip arrangement, and it made them easy to remove.

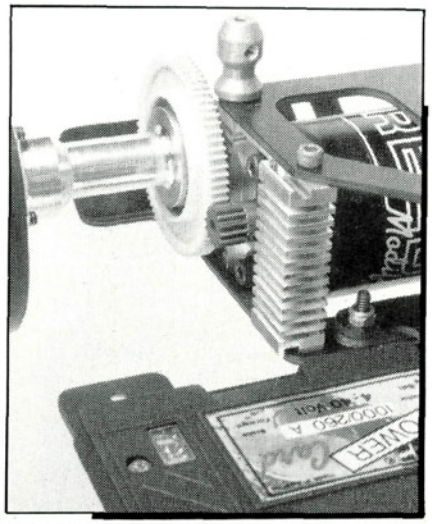
For the drive system, I chose T&A's* titanium axles and hubs. I've seen many drivers lose a race because their graphite axles split in two. Although a titanium axle isn't indestructible, I have yet to see one break.

The Magic Motorsports* spur gear worked well. The diff rings snapped into the gear, retained the diff balls and lube and prevented contaminants from entering the super-smooth diff. The spur gears come in 64 and 48 pitch, and because they're narrower than a standard spur, they reduce drag. For added security, I chose the 48-pitch gear—besides, I already had a full set of pinions to match. The new pinions from Team Losi* are very true, they run smoothly, and they fit onto the motor snugly before you tighten them, which is important. If a pinion slips onto the shaft too easily, it will offset itself once it has been tightened. A 5/40 setscrew with a 1/16-inch Allen wrench make it easy to tighten the pinions enough to secure them in place without stripping the setscrew.

I made another discovery while I was in California. MIP* has made my favorite shock absorbers even better. The new shocks are anodized and coated with Teflon. I bought a set of three in .56-, .71- and 1.32-inch lengths. They're smooth, but only time will tell how durable they are. (I'm putting the longer ones onto my RC10 for some serious testing.) So why all this fuss about a shock absorber?—because anyone who has an RC10 knows that with repeated use, the inside of a shock will wear, and the ensuing residue will mix with the oil so that it looks like metallic paint.

SCI* is a new Austrian company that offers some very impressive products. For my power-delivery system, I used its "Power Card," which is very thin and composed of leading-edge, surface-mount components. The speed controller's high-frequency switching is set at a considerably higher rate than most. With the high-frequency controllers I've used in the past, I could hear a high-pitched tone coming from the motor, because the frequency (approximately 2,800Hz) is well within the hearing range (from 20 to 20,000Hz). With SCI's controller, however, motor starts are smoother, sparking is reduced, and because of its high-pitched frequency, the tone is undetectable.

"Neutral" is the only adjustment pot on the controller; the rest of the adjustments can be made from your radio. The



Associated's new motor mount is beautifully machined and substantially increases the motor's cooling surface. Note the spur-gear ring that encompasses the diff rings to keep contaminants out.

back of the controller is considered to be the heat sink, and for that reason, it's recommended that you use a rubber band rather than double-sided tape to hold it to the chassis' surface. A rubber band wasn't strong enough for this application, so I used a small piece of double-sided tape and made sure the bottom plate could "breathe."

LEFT-TURN TESTING

For the test drive, I headed for R/C World in Danbury, CT. Because the car was extremely sensitive to my steering

(Continued on page 152)

GASOLINE ALLEY

(Continued from page 44)

Using the more usual measuring system from the plug to the first maximum diameter (or the end of first tapered cone), I fixed the length of the pipe at 195mm. Going by previous tests, I thought this length would give a maximum resonance somewhere near the rpm point where open-exhaust horsepower maximum was found. In fact, the engine surged on to a very strong 1.49hp at a higher rmp of 28,757. If you want a lower rpm/maximum resonance point (say, near 22,000rpm), you should lengthen this pipe to around 220mm.

Test 3. Pipe and plug as in Test 2: fuel—50 percent nitromethane/10 percent ML70/5 percent castor/35 percent methanol.

When you use more than 40 percent nitromethane, you usually have to reduce the amount of "non-mixing" castor oil and increase the percentage of the totally mixable synthetic oil.

This test put the engine through as much punishment as it's ever likely to endure, and the plug didn't last long—just long enough for me to obtain the usual torque reading and fuel-consumption figures. For high-nitro use at the track, increase the combustion-chamber volume by about 25 percent. In practice, the engine seems to be accurately set up for fuels containing from 5 percent to 25 percent nitro.

For comparison, I used 50 percent nitro here, and this really improved performance. It might do even better if the correct combustion-chamber changes were made to accommodate the increased gas volumes involved when "high-nitro" starts to deliver. Nevertheless, the final figure of 1.77hp at 28,260rpm is competitive with other 1/8-scale open-class R/C car engines.

SUMMARY

I stripped down the engine and found that it showed little sign of wear, so it should be a very reliable performer when it's used with the less demanding low-nitro fuels. The Picco P5 is a potent performer and will surely figure prominently among competition winners. ■

JRX-PRO

(Continued from page 41)

that the smaller surface area of the teeth creates less drag and operates more smoothly, but I can tell you for sure that this gear runs *extremely* true.

The remaining changes are mostly cosmetic: a longer body, light "Logo" dish wheels, and the famous X-pattern rear tires combined with staggered-rib front tires. Like all high-performance cars, the Pro needs some accessories, including a high-quality radio system, an electronic speed controller, batteries, a motor, pinion gears and a servo-saver.

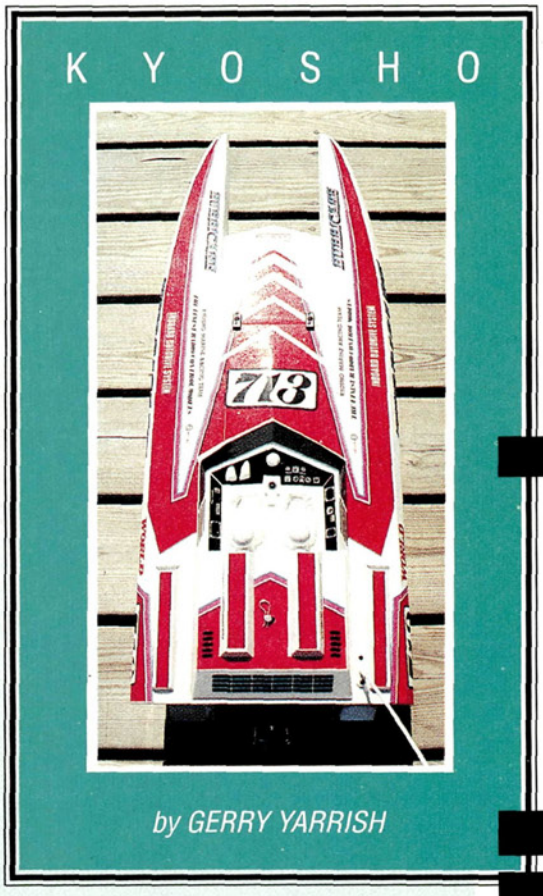
DOING THE WORK

The Losi car kits are among the few I've ever assembled in which the parts for each step are bagged together. This convenience, combined with the well-illustrated instructions, makes the Pro very easy to assemble. I must warn you, however, about extra parts (E-clips, screws, diff balls, etc.)—there really aren't any! I strongly recommend that you assemble the car over a clean work area that's cov-

(Continued on page 102)

Hurricane Storm Watch

The author enjoys the calm before the storm!



by GERRY YARRISH

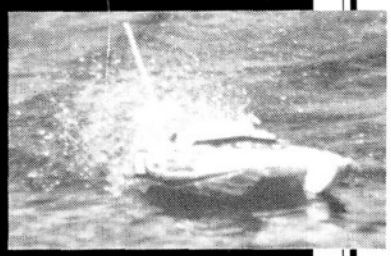
What do names like MRP, Kyosho, Traxxas and MRC have in common? As well as vengeful, competitive feelings toward one another, they all have fast electric boats in their product lines. Why?—because racers of 1/10-scale cars can "electronically relate" to them—but what's more, these water rockets provide a different kind of fun.

Now, if you're ready to scream, "They're turning the mag into R/C Boat Modeler again!" calm your nerves, clowns! We're just responding to letters showing an interest in other aspects of R/C. Moreover, you super-competitive racing disciples could regain the relaxation you once enjoyed during your entry-level R/C car days by going to the local pond with a fast electric floater. After all, Roman gladiators prepared for the fight in the arena (a day of blood-letting in the dirt much like off-road racing!) by engaging in fun and frolic the night before. Well, at least think about it; it could improve your kills—er, I mean skills!

PHOTOS BY YAMIL SUED

Hurricane

SPECIFICATIONS



Type: *Electric racer*
Length: *27½ inches (31.1 inches overall)*
Beam: *10.6 inches*
Hull Type: *Catamaran*
Weight: *4 pounds, 7 ounces (2,100 grams)*
Power: *2 LeMans 360ST electric motors*
Gearbox Reduction: *2:1*
Battery: *8.4V; 1,200 or 1,400mAh (2 recommended)*
Sug. Retail: *$229.95*
Comments: *This model is a winner! It can be assembled quickly (8 to 10 hours), and it's stable while under full power. In my attempt to increase speed, I installed two 7-cell battery packs joined by a wire "Y" harness. This increased speed, but it also made the Hurricane spin out in turns! To retain the CG location, the batteries should be placed in each sponson. Fourteen cells could burn out the stock speed controller, so you should consider a controller with a higher amp capacity. (I chose the SCI* water-cooled Power Card.)*

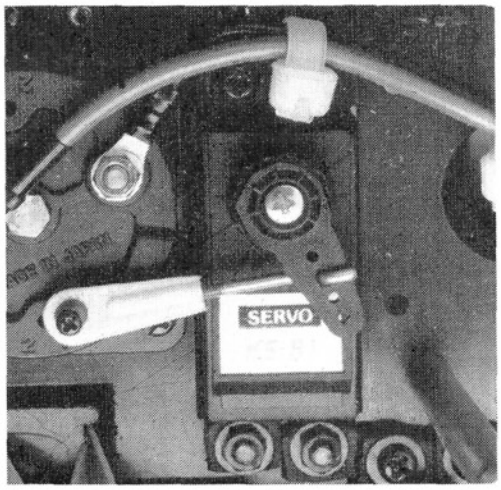
Though the instructions contain pictures to help building, at times, I wasn't 100-percent sure of what I was supposed to do, e.g., when installing the two, vertical, wooden hull supports, I didn't know where they should go. I simply slid them back and forth until I thought they provided the most deck support. A few more written instructions would be very helpful.

UNTIL NOW, I had always felt that something was missing from the performance of so-called "fast" electric racing models. The "fast" part just wasn't there! Oh sure, they were faster than the tugboats at the pond, but I was never happy with their speeds. Enter Kyosho*!

THE KIT

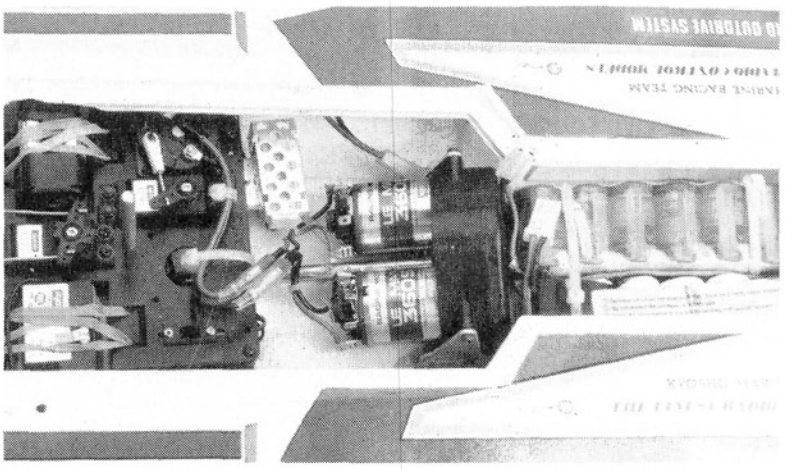
The kit's pieces were well-sorted and well-packaged. A "blister" package contained all the drive hardware, including twin LeMans 360ST motors, gearbox, reduction gears, inboard/outboard drive unit, universal coupler and propeller. Under this was the shiny (factory-joined) catamaran hull containing the small-parts bags and the nuts and screws that would soon hold everything together. The parts are in metric sizes and most are of either stainless-steel or black, injection-molded, impact-resistant plastic. The plastic parts (e.g., the servo tray, the battery holder and the drive unit) had little, if any, excess flashing around their edges.

After reading the instructions thoroughly (this took about an hour), I cut out the reference chart that identifies the screws so that I wouldn't have to keep flipping through the instructions to see whether I had the right screw or nut. The easy-to-understand booklet relies mostly on exploded-view drawings to explain the construction process, and it does an excellent job.



Close-up of the speed controller and servo. Speed control was very smooth and included reverse.

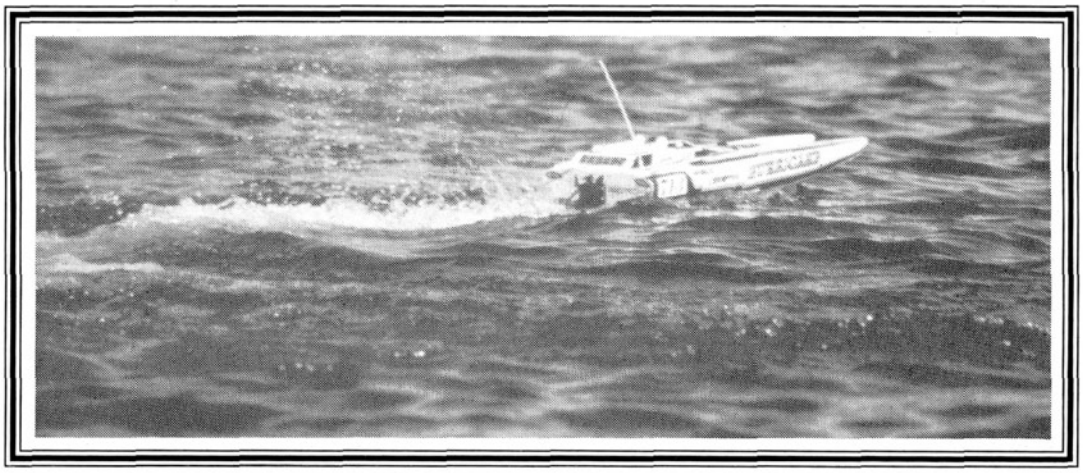
The kit includes: three Allen wrenches (1.5, 2 and 2.5mm); silicone grease; and some epoxy (not enough to complete the model, though, so have some extra 5-minute epoxy ready!). You'll also need: a hobby knife; wire cutters; a needle-nose pliers; a Phillips-head screwdriver; 3mm and 4mm nut drivers; sandpaper; paint; a paintbrush; and a small hand drill with an assortment of drill bits (these aren't absolutely necessary).



A view of the interior showing (left to right): rudder servo, receiver and battery pack, speed controller and servo, twin LeMans 360 motors, gearbox and drive batteries. Note the aluminium heat sink for the speed controller's resistor (top center).

The hull: with a hobby knife and 220-grit sandpaper, it took me about 5

Hurricane



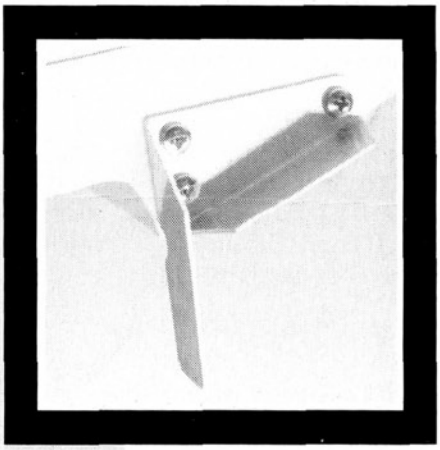
"This model is a winner! It can be assembled quickly (8 to 10 hours),..."

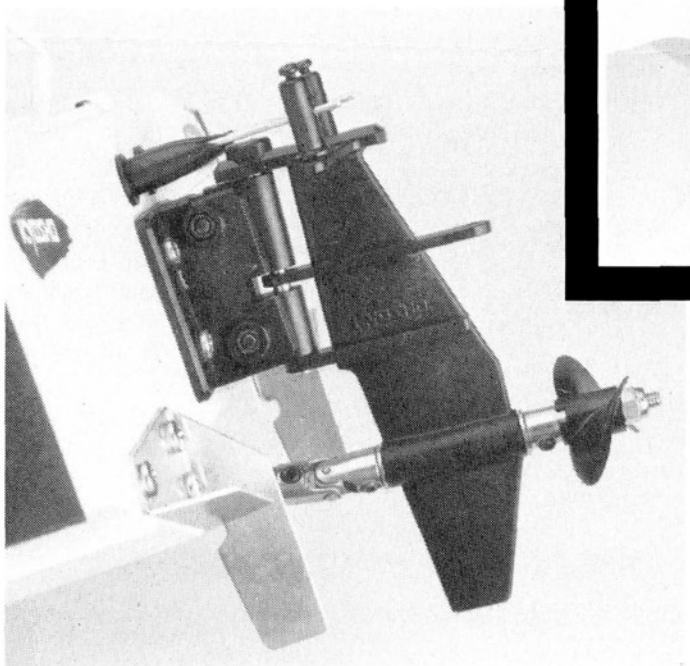
Right: The aluminium trim tab is attached with screws and need no adjustments to make the Hurricane run true.

Below: The outdrive is adjustable and helps you trim the boat to suit a variety of water conditions.

minutes to remove the flashing at the hull's joint line. (About 90 percent of it had been removed at the factory—a nice touch!) After lightly sanding the areas to which they would be glued (to strengthen the joints), I epoxied the four die-cut plywood pieces, the hull's two support pieces and the two trim-tab mounts. To align the trim-tab mounts correctly, I held the hull up to my strong workshop light so that I could see through it and find the right positions. I held the mounts in place with masking tape until the epoxy had cured.

The gearbox: following the exploded view shown on page 6 of the instructions, I attached the two motors and the aluminum heat sink, and then I attached the two pinion gears to the output shafts, tightening the screws and setscrews. *(Warning!* Don't use Loctite on these components because it dissolves this type of plastic!)





Next, epoxy the drive tube into the gearbox housing, making sure that the end with the oil-lube hole is toward the box and on top of the tube. To ensure the correct gear mesh, the tube should also be flush with the inside of the box. Install the two flanged bushings next; don't use too much epoxy, or it will bind the shaft and reduce your running times. (Apply just two dabs, and then twist the bushing in, and wipe off the excess before it cures.)

Mount the two aluminum mount brackets, and tighten them to the angle called for in the instructions. When everything has cured, slide the well-greased shaft into the tube, attach the large pinion gear to it and re-tighten the screws. To install the assembly, slide the tube into the exit hole, and tape it into place so that a length of 36mm is exposed and the tape forms a dam at the exit hole. Mix a little more 5-minute epoxy and pour it into the exit well. Poke it a few times with a wire to help it settle in, and when it has cured, the exit hole will be completely watertight. Be sure to use a lot of epoxy on the aluminum mount brackets and sand the hull at the points of contact again.

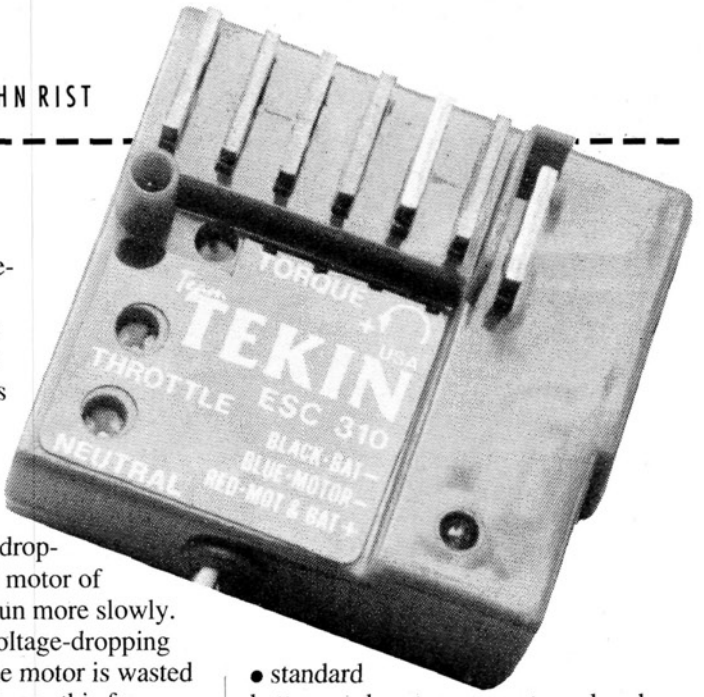
Trim tabs and outdrive assembly: there's nothing difficult about these assemblies; just follow the drawings carefully and don't tighten the screws too much, because it's easy to strip the threads. I used Loctite* on the universal and drive collar, but took

(Continued on page 136)

SCOPING OUT

by JOHN RIST

Tekin's ESC 310



I'M HOOKED on electronic speed controllers because my *introduction* to R/C cars was with *racing*. My first car was an Ultima (the original one with red shocks), which had a mechanical speed controller. It didn't take me long to discover that to be competitive, I needed three things: ball bearings, an electronic speed controller (ESC) and a good driver! My son Joe (then 17) did an exemplary driving job, and my hobby shop sold me a set of ball bearings and a Tekin racing-style ESC. My racing performance immediately went from consistent "dead lasts" to regular chances at the A-Main!

So what are the advantages of an ESC compared with a mechanical SC?—

- longer running times
- smoother throttle response

The longer run times occur because, when you're running at less than full bore, a *mechanical* SC switches to a resistor bank that's in series with the motor. This dropping resistor robs the motor of power and makes it run more slowly. The power that the voltage-dropping resistor takes from the motor is wasted as heat. If you want to see this for yourself, touch the voltage-dropping resistor in an Ultima after a hard run, but be careful—third-degree burns are painful!

On the other hand, an *electronic* SC acts as a switching regulator: if you're running at half-throttle, the ESC will be switched on for half the time. In most ESCs, this switching action happens 60 times a second. (In the newer high-frequency controllers, the switching rate is much faster.) It takes less power to run a motor at half speed, using this switching action to control power, than it does when using a voltage-dropping resistor that wastes power. (Hence, longer running times.)

An ESC also has a smooth, linear, throttle response—unlike the two or three steps of a mechanical controller. This month's "Scoping Out" victim—the Tekin* ESC 310—is a direct descendant of my first ESC and, as such, brought back memories of racing in the good old days. I opened the bright red Tekin package and found an ESC with these features:

- racing style; forward only, with brakes
- six FETs for forward; one FET for brakes
- Tempfet burnout protection
- 4- to 10-cell operation
- built-in pulse checker
- built-in torque limiter
- standard battery and motor connectors already installed

The ESC 310 also includes: an instruction book, a heat sink, a pot-adjustment screwdriver, motor capacitors, bright Tekin decals and double-sided mounting tape.

I quickly opened the case by removing the four screws in the bottom and immediately saw that the ESC 310 is well-constructed. Several parts that were tacked between other parts on top of the board looked a little "so-so," but I suspect that Tekin had no other place to put them. (Given the large number of parts it contains, this controller is as small as it could be.)

Tekin has gone to great lengths to make this a high-performance controller: the FET leads are bent over and bridged with solder. This technique adds a lot of "beef" to the printed-circuit board etch in the area where it's needed to carry high current, and the ESC 310 should withstand the pounding we usually give an ESC in an off-road car.

Low resistance is an SC's most important electrical characteristic, and to see whether Tekin's claims for the 310 would hold up, I headed to the "Scoping Out" lab to take my own resistance measurements. The Pit Stop radio provides a convenient way of controlling the SC without having to fight the

(Continued on page 100)

THE "SCOPING OUT" LAB

John Rist's lab consists of:

- **an oscilloscope**
- **a digital voltmeter**
- **a resistor load bank**
- **a 6V 30-amp electricity supply**
- **a Pit Stop Radio servo/speed controller tester.**

The oscilloscope is used to monitor the controller's output and to guarantee that it's fully on.

The digital voltmeter takes all the voltage-drop readings and verifies the reading on the current meter.

The resistor load bank consists of 40, 12-ohm, 5-watt power resistors, which can be switched on and off one at a time to vary the load between .6 amps and 20 amps, but the standard 12 amps are usually used.

In series with the resistors is a 25-amp Simpson current meter and a 1-percent .01-ohm resistor. By measuring the voltage drop across this resistor, the current-meter's reading can be double-checked. Of course, the lab power supply provides the test current.

spring-loaded trigger on my Futaba transmitter.

When you're dealing with a new speed controller, it's important that you *first* read the instruction sheet. The comprehensive book that comes with the ESC 310 gives good advice on how to set up a variety of transmitters to operate with it. Because it's a new feature, read the detailed description of the proper use of the torque limiter (punch control) *very carefully*.

My only complaint about the instruction book concerns the drawing that shows the connection between the ESC, the battery, the motor and the receiver. The picture shows two controllers—the ESC 310 (a four-wire controller) and the ESC 610 (which has three wires). The drawing shows the four wires coming out of the controller, but it also shows the extra wire that must be added to the 610 to make it work. If you add a wire, you won't hurt anything, but it will be difficult to connect to the stock connectors on the ESC 310.

The other confusion arises because the picture shows a Deans plug (the connector provided with the ESC 610) connecting the battery to the 310, instead of the stock connector that actually comes with it.

TEKIN ESC 310

DIMENSIONS:
Height ..... 0.75 inch
Width ..... 1.4 inches
Length ..... 1.63 inches
Weight with wires ..... 1.9 ounces

TUNING:
Access to Controls ..... Good
Ease of Adjustment ..... Fair

PRICE:
Sug. Retail Price $115.99
Warranty ..... 120 days

ELECTRICAL:
(Manufacturer's Specs)
Max Voltage ..... 14 volts
Min Voltage ..... 2.8 volts
Peak Current ..... 1,260 amps
Continuous Current ..... Not listed
Resistance ..... 0.003 ohm

TEST PARAMETERS:
Voltage ..... 6 volts
Current ..... 12 amps

TEST RESULTS:
Voltage Drop
with connectors ..... 0.29 volt
Voltage Drop
at 2-inch point ..... 0.07 volt
BEC Output,
6-cell battery ..... 5.52 volts
Resistance
with connectors* ..... 0.024 ohm
Resistance,
2-inch wire point* ..... 0.006 ohm
*Resistance=Voltage Drop/Amps

COMMENTS:
The ESC 310 is Tekin's least expensive speed controller, but it isn't short on performance. Although its resistance isn't as low as those of most top-of-the-line, 7-FET SCs, it's better than most of the other budget-priced controllers I've tested. There's no shortage of hot features, e.g., torque control and built-in pulse-checker. The long wires and stock connectors are convenient for first-time ESC installers, but they're responsible for a major reduction in performance. To check it, first install the controller with its original connectors, then improve performance by shortening the battery and motor wires and installing racing connectors, e.g., Sermos Power Pole connectors. The ESC 310 is an excellent choice for any first-time ESC buyer who's hunting a maximum bang for the buck.

LAB TESTS

With the controller connected and adjusted according to the instructions, I was ready to take some voltage-drop readings. I always take the readings at two points:

- along the full length of the wires (from end to end, including the connectors)
- 2 inches along the wires

The first reading establishes the SC's out-of-the-box performance level; the second reading demonstrates the power-robbing effect of long wires and connectors. The second reading also provides a measurement by which many SCs can be compared.

With 12 amps pumping through the ESC 310, the first reading showed a voltage drop of 0.29 volt—a resistance of 0.024 ohm. The reading at the 2-inch point was 0.07 volt—a resistance of 0.006 ohm. Although this resistance isn't as low as those of some high-buck 6-FET ESCs, it's lower than those of many other *budget-priced* controllers. It's interesting that the readings obtained with the long wires and connectors are four times worse than those at 2 inches along the wire. To realize an ESC's potential, be sure to consider wire length and connector quality when you're setting up your racing machine.

LET IT COOK!

For this test, I pass a hefty 20 amps through the controller for 15 minutes, without the benefit of cooling air or heat sinks. After 15 minutes, the ESC 310 was quite hot, but still operating normally. With a heat sink and air cooling, it should survive racing applications that require a 4-minute battery dump.

My final test is a dead-short test, which is designed to determine whether the controller would survive if the motor jams or burns out. Using a shorting device made of monster wire and two alligator clips, I shorted directly across the motor output leads to see whether I could force the ESC 310 into thermal shutdown.

A few words of advice about Tempfet-style SCs: always use a heat sink because, of the six forward FETs, only one is a Tempfet. You can look at the FETs' heat-sink tabs and tell which is the Tempfet—it looks slightly different from the others (on the ESC 310, it's silvery instead of copper-colored). On low-budget controllers, it isn't unusual for the five FETs that don't sense temperature to have a higher resistance than the Tempfet. So what happens? Five of the FETs become really hot, while the Tempfet still runs cool. Of course, this spells disaster, because until the Tempfet gets hot, it can't shut down the controller. For this reason, I used a heat sink for this test.

With the short applied, the current-meter reading jumped to 42 amps. I sat back and watched the clock as the cooking progressed. After 2 minutes, I had to end the test because the wires were getting too hot to touch and the stock connectors were starting to melt! I never did force the ESC 310 into thermal shutdown, but it took the licking and kept on kicking!

ROAD TESTS

It had survived my lab test, so it was time to take the ESC 310 for a ride in my Bolink Eliminator pan car. With the stock connectors still in place, I only had to install the controller securely in

the car with servo tape, and then plug in the battery, motor and receiver connectors. I mounted the on/off switch by using a cable tie.

With a variety of charged 6- and 7-cell battery packs in hand, I headed to the school's parking lot. With its realistic, bright orange Thunderbird body trimmed with stock-car decals and numbers, my pan car is always a crowd-pleaser. I use a B&R Bullet stock motor; its timing is cranked so far that it's difficult to gear for a 4-minute run, but it's very fast in a wide-open parking lot.

For the first run, I installed a 6-cell battery pack. I double-checked to make sure that the torque control was set to maximum and that the pulse checker indicated "full-on" at the 80-percent trigger point. Then I turned the car loose for a screaming run across the asphalt. An after-run check revealed that the motor and battery were much hotter than the controller, so with its heat sink installed, the ESC 310 was definitely up to the task.

For the next run, I adjusted the torque control to minimum, and at this setting, the car had no zip; in fact, it felt as if the battery was about to dump. With torque settings available all the way from "hot" to "cold," it should be possible to find an acceleration setting to suit any track, from slippery to high traction.

During the tests, the ESC 310 demonstrated a very linear, smooth throttle response. Braking isn't superstrong, but it's adequate for most racing conditions and strong enough to perform crowd-pleasing, 180-degree, end-swapping turns. As you'd expect from Tekin (one of the oldest SC manufacturers), the ESC 310 performs really well.

CONCLUSION

The ESC 310 is moderately priced, yet very capable. Its switching rate is at the traditional 60 times a second, rather than at the 2,000- to 3,000-cycles-per-second of the newest controllers. (See "Scoping Out" in the December '90 issue for a review of the Tekin TSC 411P.) For most applications, this has worked well and

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JRX-PRO

(Continued from page 91)

ered by an old towel, which will catch any small parts that slip out of your hands during assembly.

During the first part of the assembly (when the suspension bulkheads are attached to the chassis), my only problem was that the holes in the chassis and the parts I had to attach to it were misaligned. It wasn't so bad that the parts couldn't be installed, but it was bad enough to make the last of the four screws pretty tough to get started when the others had been tightened.

The second series of steps encompass the assembly and installation of the transmission. This requires no additional help from me, but I'll confess that I eventually used a different diff lube from that supplied (I'll explain later).

The shocks themselves are excellent and easy to assemble, but when it was time to attach the shock ends and springs, a couple of the parts turned out to be de-

(Continued on page 107)

JRX-PRO

(Continued from page 102)

fective. Of the four shock ends, two had split along what looked like a seam made during the molding process. Further, one of the adjustable spring collars for the shock split as the 4-40 screw used to adjust the collar was threading its way through it.

With the chassis completely assembled, I just had to paint the body and install the electric and electronic accessories to have a race-ready machine.

I chose a Futaba* PCM 1024 radio with an optional S9101 servo. Steering response has always been important to serious racers, but traditionally, the faster servos were rather weak in the power department. The S9101 servo is the second fastest in the Futaba line, and it's also one of the strongest. It will improve steering response during heavy cornering, where weaker servos struggle.

On the radio's second channel, there's a new Tekin* 411P electronic speed con-

(Continued on page 114)

Some people think the editors of Radio Control Car Action "eat and sleep" R/C cars! Well, they're wrong! Although we do spend most of our time tinkering with dogbones and fiddling with caster, we sometimes venture into new territory—especially when it's not too different from what we're used to, e.g., another aspect of modeling—R/C planes and boats, for example.

The Kalt Whisper electric helicopter is a somewhat sophisticated R/C model, but it's not beyond the average car enthusiast's building capabilities, and it does have some familiar electronics, such as a 540 VS Mabuchi motor for power. So, the next time you're wondering what else you can do with all that expensive charging gear, or if you'd like to try your hand at "sled-lifting," give an electric helicopter some thought.

Want information on R/C helicopters? Check out the special Heli Section in every issue of Model Airplane News (one of our other publications).

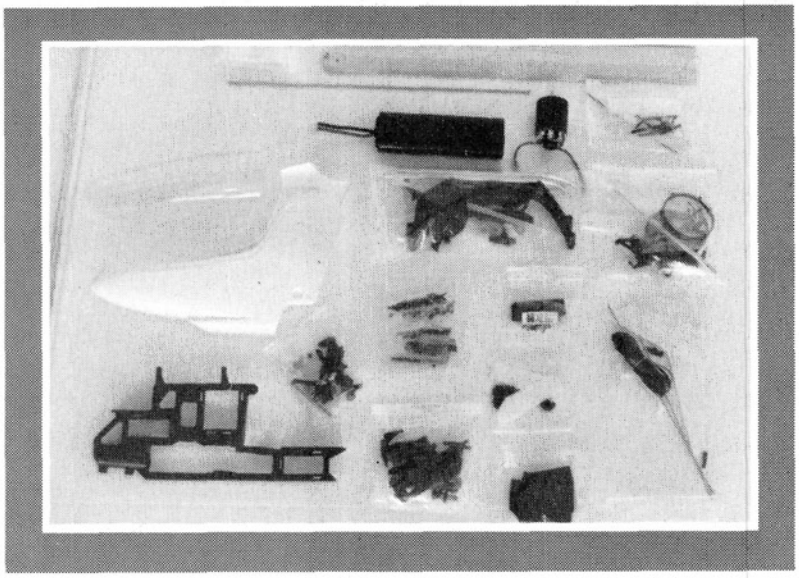
KALT Whisper

SILENCE ROARS LIKE THUNDER

by CRAIG HATH

ELECTRICS ARE quietly taking hold in the R/C airplane hobby, but helis are one of the last of the holdouts. In the recent past, electric-powered helicopters had little to offer except poor performance and high cost. I tried two, but despite my competent approach to building and flying them, I was unsuccessful at getting either to fly reliably; in fact, one of them wouldn't leave the ground at all!

The biggest defect of early electric helis was that they were too small (this contributed to their instability), and the rotor disc's angle of attack was fixed (fixed pitch; more on this later). Going way back: I remember an electric helicopter that was called (I think) the "Playboy." It was a little larger, and presumably easier to fly,



PHOTOS BY CRAIG HATH & BLAINE HATH

The parts for the major assembly steps are bagged together.

but the overall scene with R/C electric helis has been fairly bleak and frustrating. Enter the Kalt* Whisper!

My first exposure to the Whisper was at the summer '90 Kyosho Challenge in Champaign, IL. Kalt had sent Yoshiaki Nagatsuka over from Japan to demonstrate a Whisper prototype, and he was able to do "magic" with it: loops and rolls—even autorotation. The Whisper was a crowd stopper! From then on, I knew electrics had really come of age, and being able to do an in-depth review of the Whisper has helped heal the wounds from my past electric helicopter adventures.

THE KIT

The Whisper is a "serious" model helicopter, and it's very much like the larger Kalt helis. It's designed around a collective-pitch rotor system, and this makes a major contribution to its good performance. Having "collective pitch" means that as the throttle is opened, the rotor blades' angle of attack increases to develop lift. A heli with collective pitch is much easier to fly because control inputs for making it rise and fall produce immediate results.

Fixed-pitch rotor blades are locked in one position, or angle of attack, and the lift is varied by changing the rotor-head speed. This system can really be tough to handle, because there's often a lag between the moment when the throttle is opened to create more lift and when lift is actually available. Imagine stepping on the brakes of your car and having to wait for them to grab! Collective pitch enhances the Whisper's performance.

The Whisper's size is important, too, because a larger heli has more chance to fight wind gusts and strong breezes. If you were to compare the Whisper's size with those of gas-powered model helis, it would be roughly the equivalent in power to a .10- to .15-size machine. In designing the Whisper, Kalt started from scratch. (I didn't see any parts that had been taken from other heli kits.) Their main concerns were simplicity and saving weight.

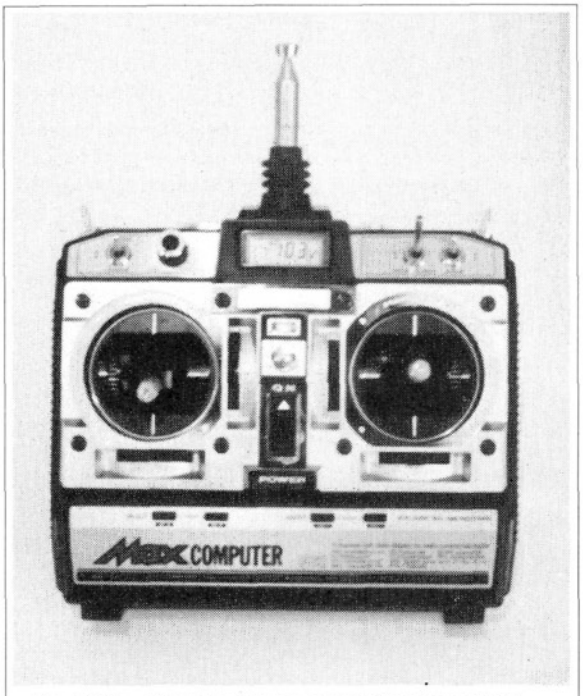
- The primary mechanics are assembled together around a single frame or crutch.
- The tail rotor is driven by a toothed drive belt so that no transmission is needed to turn the tail-rotor blades.
- Most of the components are made of a light carbon-fiber-reinforced plastic.
- To save weight, the main-rotor shaft and stabilizer bar are both made of hollow stainless steel.
- The motor is a Mabuchi 540 VS.

The Whisper is available as a basic kit that requires you to assemble all the major components, or as a partially assembled version that needs only minor assembly and installation. Kalt's U.S. distributor, Hobby Dynamics, also offers a Whisper accessory pack that includes: three JR305M microservos and one JR3035 servo (for collective pitch); the new Kalt electronic helicopter speed controller; the Kalt mini-gyro; and an 1100mAh, 9.6V, Ni-Cd battery pack.

You'll also need a 5-channel (or more) helicopter radio system and a charger that's capable of quick-charging the 9.6V battery. Two metric hex wrenches are included with the kit, and you won't need any other special tools.

CONSTRUCTION

My kit was the basic version and, aided by the step-by-step assembly manual, its construction was very straightforward. I won't go into details because the manual handles construction so well, but I will, however, share some observations and clear up



The JR Max Computer 6 radio system handles control.

some of the difficulties I had. (The manual I had wasn't the final draft.)

Assemble the rotor head first. The drawings show shouldered ball bearings for the see-saw hub. You must insert the shoulder bushings into the ball bearings from the inside of the hub and fully seat the bearings. Be sure that the two ball bearings in each blade grip are fully seated before you attempt to screw the grips into the hub plate.

During assembly, you'll find that some of the fasteners for each step are packed in the parts bag with which you're working; if you're missing a screw or a bolt, you'll find it in one of the bags of fasteners. The kit included every screw I needed; I just had to dig to find them.

To be sure that the parts fit, trial-fit the pitch-control rods in the pitch-control ring before installing it into the mainframe. I had to remove a little plastic flashing from the pitch-control ring before I could get one of the rods to fit into it. Be sure to use Loctite* thread-locking compound (or an equivalent) on the tail-rotor hub setscrews and tail-rotor blade grip screws. *Don't* get any of it into the tail-rotor blade grip bearings.

In the manual, you'll note that a new shock-absorbing landing-gear system is used. (Be sure to look at the drawing.) Cut a small piece of silicone tubing into four equal lengths, and slide one over each of the four steel bushings. I had trouble getting the stabilizer bar clamped down tightly enough with the plastic retainers. A 2mm Allen-head screw could be traded for this part to make tightening easier. I put a clevis on the end of the tail-rotor pitch-control linkage and fished it through the tail boom; I also hooked the clevis over the toothed belt and pulled the belt back through the tail boom. You can tension the drive belt properly by pulling back on the tail boom just until the slop between the belt and the gear has been removed.

The manual didn't mention a motor break-in procedure, and there are several ways to approach this. I dipped the motor into a glass of cold water and ran an entire charged battery pack down. Alternatively, you could run the motor at full speed for five minutes, allow it to cool for five minutes, and repeat this cycle for about an hour or so. You may have your own method of motor break-in; whatever it is, you should follow it before installing the motor.

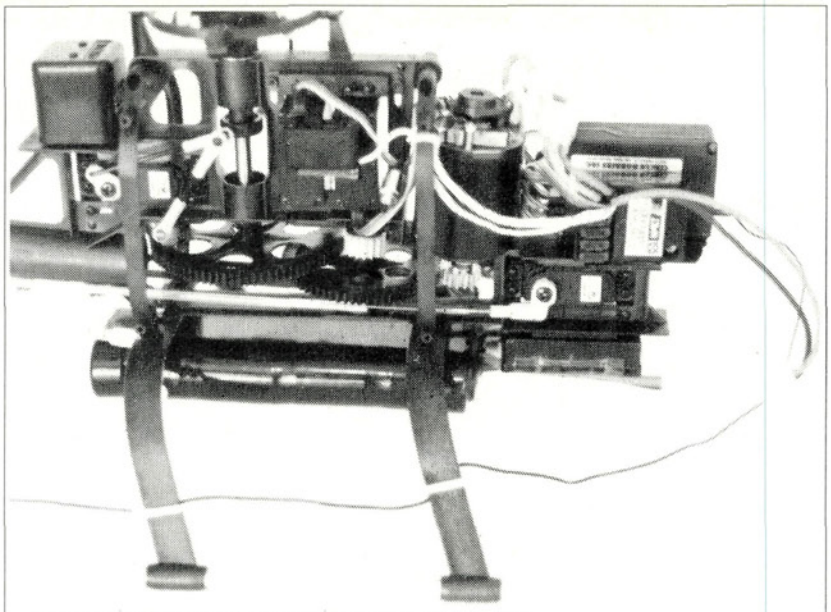
Before you tape the gyro amplifier box under the front of the mainframe with double-sided tape, look at the box itself. On one side of it, there's a door that's taped shut. Mount the box so that the door faces downward and can be reached without taking the box off the mainframe. The amplifier box contains the gyro reversing switch and sensitivity adjustments; you'll need access to these later.

Hooking-up the radio gear and connecting the servos to their control linkages is fairly uncomplicated. *Make certain that the servos are centered* before you install the output arm, and *check the trim levers* on the transmitter. Being off-center here can cause the helicopter to respond unevenly to control commands. A special note about the position of the collective-pitch arm: the centered position of the servo-output wheel, as shown in the manual, intends that the transmitter collective/throttle stick is in its mid-throw, or centered, position. This is the point at which the helicopter should hover.

BUILDING THE ROTOR BLADES

You'll find four aluminum washers in the bag that contains the white heat-shrink tubing. Use these washers in place of the plastic ones shown in the manual. Glue the washers into place with CA or 5-minute epoxy.

Even though the blades are supposed to be balanced at the factory, you should check them to be sure. I have a scale that weighs to within 1/10 gram. The blades in my kit differed by 1.2 grams, which is a very large discrepancy for a small set of rotor blades. If you don't have a scale, use a model airplane prop balancer like the one by Prather Products*. Balance the blades *after* they've been



This is the right side of the completed radio installation.

covered; add tracking tape (included on the decal sheet) to the tip of the light blade until the two blades sit level in your hand.

The steam coming out of the spout of a tea kettle filled with boiling water is at the perfect temperature to shrink the heat-shrink covering without melting it. When you've shrunk the blade material tightly over the blades, trim off its ends and seal the covering to the blade tips with CA.

The manual mentions that reinforcement plates are to be glued inside the body. In the kit, the plates start as a white plastic piece that must be cut into the four reinforcing parts. Glue the plates over the dimples where the body-attachment screws go, and *don't skip this step*. Go over the machine thoroughly, checking for loose screws, nuts or bolts, and recheck all moving parts for any binding or excessive slop. Use some small cable ties to keep the radio wires out of the gear mesh and away from hot areas.

FLIGHT PREPARATION

Go over the preflight checklist in the manual carefully. Make sure that the speed controller is adjusted so that the motor will stop when the throttle stick is in the full-low position.

I found that my Whisper flew best using this pitch curve: hover or neutral, +4 degrees; top end, +6 degrees; low end, -1 degree. If you attempt to hover the Whisper using 9 degrees of pitch (as shown in the draft version of the manual that came with my review kit), the tail rotor will be uncontrollable because the rotor blades' low speed won't allow the tail rotor to turn fast enough to counter the torque of the main rotors. You may have to vary this somewhat for a stronger motor; for aerobatics, you'll need a little more negative pitch on the low end.

ROTOR TRACKING

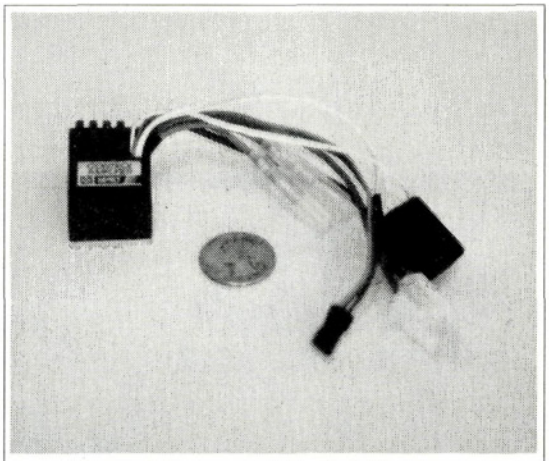
The rotor blades are difficult to track because, when the linkages are only adjusted half a turn, it makes a great difference to the blade tracking. Have patience here: for the best performance, the blades must track *perfectly* in a hover. To prevent the rotor head from being damaged during storage, mark and remove the rotor blades after each flying session. When you put the rotor blades back on the head, make sure each is in its *original* blade grip, and retrack them before every flight.

WE'RE FLYING!

Now we can have some fun! When I flew it, the Whisper turned out to be quite a surprise! At first, I had some difficulties because the recommended pitch curve was a touch too high. When I had worked this out, the machine came into its own. Owing to the low speed of the tail-rotor blades, I had trouble controlling the tail rotor; but when I increased the main-rotor hover speed by reducing its pitch, I regained control of the tail.

I was surprised at how stable the Whisper felt in a hover. It's very solid around neutral, yet responsive to the controls

I chose the JR* Max Computer 6-channel radio, and its many features are adequate for the job. Having the computer control total servo throw, direction and neutral point allows for a fine-tuning process that never leaves the transmitter. I continue to refine these adjustments, and the helicopter just seems to get better with each flight.



This photo shows the sizes of the Kalt speed controller and gyro—very compact!

I was surprised at how stable the Whisper felt in a hover. It's very solid around neutral, yet responsive to the controls. I took many of the flight photos in gusty winds, which the helicopter handled well. Flight times have exceeded 5 minutes, and longer flights should be possible with batteries of a higher capacity.

Is the Whisper suitable for beginners? I think it has possibilities, as long as they install a good set

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JRX-PRO

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troller. To keep it brief, this SC, with its regenerative feature and torque control, is one of the latest rages. (For more information, read "Scoping Out" in the December '90 issue of *R/C Car* Action.)

I used a pair of Team Losi motors—a Motown Missile, which is a 12-turn single, and a Jr.'s Choice, which is a 17-turn triple. I combined these motors with Trinity* Pushed SCE 1700s and SCR 1400s. For hard-packed tracks on which traction is a major concern, I combined the 17-turn motor with the 1400s. On this type of track, batteries aren't much of a concern, but having too much horsepower *is*. When properly geared, the 1400s provide plenty of speed and run time, and the 17-turn triple motor is just docile enough to prevent the tires from breaking loose in turns. For medium-to-high-bite tracks, I installed the very powerful Motown Missile motor and the Pushed 1700s. These tracks can tolerate much more

(Continued on page 119)

■ *Left: The graphics shown here are for the stock car shown below, but they can be altered to fit any other style of car, e.g., the Indy car shown above.*

■ *Above: Before you remove its backing, position the graphic and mark its location with a grease pencil. When you've removed the backing, line up the pencil marks, and squeegee the solution out from underneath.*

Microchip masking for the ultimate detail!

IT'S BECOMING increasingly difficult to create a car body that looks unique. There are plenty of decals to duplicate some of the more popular cars, but what do you do when the decal you want doesn't exist?

You can spend countless hours trying to cut them out of masking tape or contact paper, or you can call Custom R/C Graphix®.

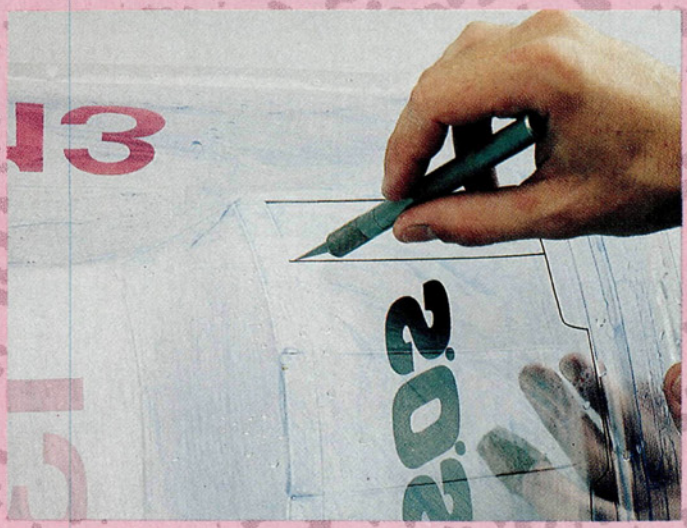
Painting graphics onto full-size cars is rarely done now; today, they're cut from colored vinyl with the aid of a computer. When a body part has to be replaced, you just slap a set of graphics onto the new piece and go. If a team has a few sets on hand for future repairs, it's relatively inexpensive to keep the car looking new for every race.

By programming the computer to make smaller graphics, Custom R/C Graphix can use the computer system that's used for full-scale cars. Once the computer has scanned in the design, it can be stretched, compressed, slanted, or reversed before cutting begins. Multicolor designs are possible with multiple overlays (there are over 75 color choices), e.g., if you want a number to have a black shadow behind it, first apply the black number in the desired location. Then apply a colored version of the same number over the black one, but place it slightly askew. A variety of 3-D effects can be produced, depending on the amount of black showing. (If you'd prefer to paint a design, the computer will also cut in reverse to make paint masks.)

The vinyl sheets are backed with semitransparent release paper. Since the computer only cuts through the vinyl, the letters remain stuck to the release paper, evenly spaced and properly aligned. The material around and inside the design

Custom-Cut GRAPHICS

by JOHN HUBER



The 1/32-inch Pin Line tapes are great guides for cutting liquid-mask patterns. They can be removed after painting, or left for borders the colors.

must be removed carefully by hand—a time-consuming and difficult process called "weeding." The people who do this make it look easy, but I've tried it and, believe me, it's tough. Once the waste has been removed, you can transfer the word onto the car in one shot, and the letters always come out equally spaced.

It's easy to see through the release paper to align one color over another. The dots you see around Mr. Streak are used to position the two colors, and then they're removed.

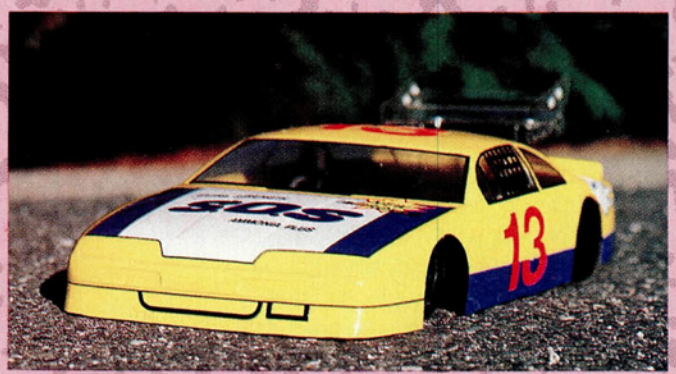
SOLUTIONS

To avoid air bubbles and to help with positioning, Custom R/C Graphix has two products that "hydroplane" their vinyl: the "Application Solution" makes it easier to move the pieces, and this is important when you position one color over another. Their "Quick Release Solution" (for smaller, one-color pieces) is sprayed onto the car and onto the adhesive side of the graphics. Once the vinyl has been positioned, the solution is squeegeed from underneath the piece to ensure a smooth, bubble-free finish. The vinyl is flexible enough to conform to most body contours, including compound curves.

I asked Custom R/C Graphix to do a job on a car that I was working on. I thought the brightly colored design that appears on bottles of SOS Glass Cleaner would look great on my car, so I took the bottle to them. They measured my car body and within a week, they made the graphics for me—they were even able to reproduce "Mr. Streak."

Before painting the body, I applied two generous coats of liquid mask. Apparently, I wasn't generous enough, because I had a tough time removing it. (The thicker the coat, the better; otherwise, it peels off in little pieces, rather than in sheets.) To paint straight lines, I mapped out the borders of my colors with Custom R/C Graphix's Pin Line Tape, which has 31 pieces of tape (1/32 to 3/16 inch wide) all

(Continued on page 170)



■ *Above: When painting has been completed, use the Pin Line tape to trim the windows and to separate the colors.* ■ *Left: After you remove the first piece of mask, begin painting. When removing the next piece of mask, watch for flakes of dry paint that may settle on the body and spoil the next color.*

JRX-PRO

(Continued from page 114)

horsepower, but the drain on the batteries is substantially higher, and that's the reason for the 1700s.

PRO PERFORMANCE

I tested the JRX-Pro on a variety of tracks all over my home state. The first test was at R/C World in Danbury, CT—a fast, medium-bite surface; the second, at Hi-Tech Hobbies in Enfield, CT—a very high-bite surface; and the final, at the Connecticut R/C Off-Roaders Club in Fairfield—a very slippery, hard-packed track.

During initial tests, I had problems: even on high-traction surfaces, the rear end broke loose and spun under acceleration. The front end bit extremely well, and when combined with the 17-turn motor, the Pro was a handful in turns. I inspected the car and saw that the differential wasn't

(Continued on page 136)

MODIFIED MOTOR MAINTENANCE

by STEVE POND

RUNNING A modified motor is one of the most challenging and rewarding experiences in R/C car racing. Choosing the right motor for the application and the proper gear ratio for maximum speed and run time, and setting up the car to handle the motor's extra horsepower are all part of the challenge. A bonus is that modified motors can be disassembled, cleaned and maintained.

During any visit to a track, you'll often hear praise of or complaints about the performance of a certain type of modified motor. "This wind works better than that wind," or "'X' brand works better than 'Y' brand." So what's the bottom line? Unless you race at world championship levels, most high-quality modified motors will be competitive—the key is proper tuning and *maintenance*. During the past year, many products have been introduced specifically to help you maintain your motor, but if you don't know how to maintain it properly, you could do it more harm than good.

TO REBUILD, OR NOT TO REBUILD?

How do you determine whether your motor should be rebuilt or simply needs a thorough tune-up? Under any circumstances, after about 20, 4-minute runs, your motor's performance will have deteriorated enough to warrant rebuilding. The determining factor is the condition of the commutator, which should be checked for excessive wear and heavy black traces of carbon around the slots. The commutator will obviously be marked where the brushes touch it, but these marks can be cleaned off with motor spray and a commutator cleaning stick. *Heavy* black marks and a *deformed* commutator are signs that you're *way* past due for a trip to the motor shop!

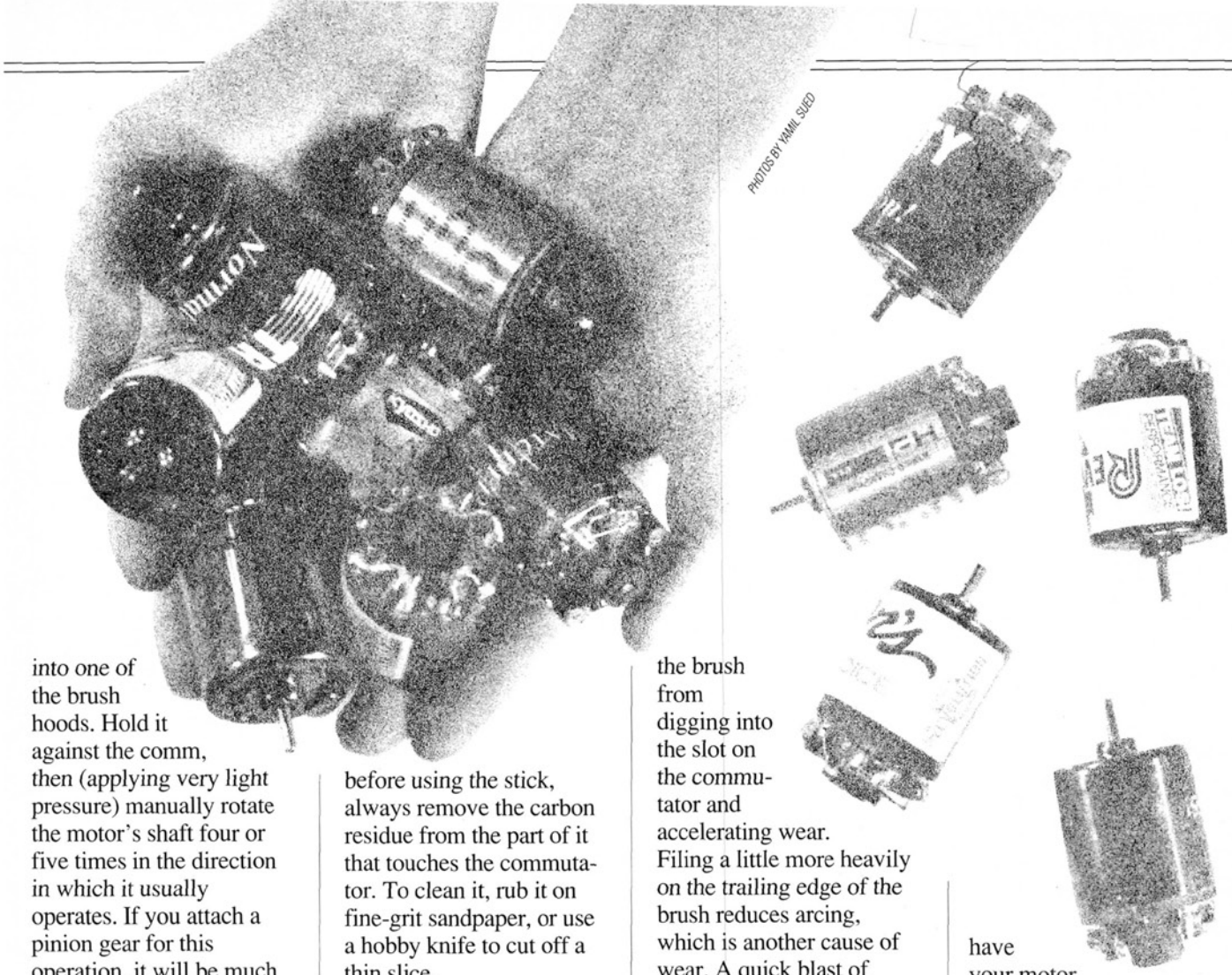
Between motor rebuilds, it's essential that you do the correct maintenance jobs to extend the number of strong runs you can expect. It isn't as complicated as many would have you believe; in fact, just a few easy steps can keep your motor running stronger for longer. It doesn't mean disassembling the motor, changing the brushes, and resetting the timing; it's just simple maintenance.

COMMUTATOR CLEAN-UP

Every couple of heats, take the motor out of the car and give it a quick once-over. Take the brushes out of the brush hoods, and clean the commutator with a comm cleaning stick (the most popular and effective way to do this job). Run it across the face of the comm, and its mild abrasive compound will remove most of the horsepower-robbing carbon deposits. The sticks are cut in the shape of a brush, so you can clean the comm through the brush hood without disassembling the motor.

Insert the cleaning stick

S C O U R F O R



PHOTOS BY YAMIL SUED

into one of the brush hoods. Hold it against the comm, then (applying very light pressure) manually rotate the motor's shaft four or five times in the direction in which it usually operates. If you attach a pinion gear for this operation, it will be much easier to spin the motor.

It's vital to avoid applying too much pressure to the stick. Even when you've completed a proper cleaning, the comm will still show signs of use, but motor performance won't suffer. The classic mistake here is applying so much pressure on the stick that, by the time you've finished, fresh copper is showing. This means you've removed too much material and, because the comm stick is far from being a precision-machining instrument, the results are a deformed, damaged commutator and a significant reduction in performance.

For the best results, before using the stick, always remove the carbon residue from the part of it that touches the commutator. To clean it, rub it on fine-grit sandpaper, or use a hobby knife to cut off a thin slice.

BRUSH BEAUTIFICATION

When you've cleaned the commutator, move on to the brushes. Most commutator cleaning sticks also have a round end that's used to clean the brushes where they touch the comm. Put the cleaning stick in the groove that's worn in the brush, and run it across the brush's face a couple of times to remove the accumulated carbon deposits.

When the face of the brush is clean, *gently* use a small, flat file to take off the sharp edges on the brush where it touches the commutator. This will prevent the front edge of the brush from digging into the slot on the commutator and accelerating wear. Filing a little more heavily on the trailing edge of the brush reduces arcing, which is another cause of wear. A quick blast of motor cleaner in the commutator followed by some commutator lubricant finishes the tune-up.

At this stage, avoid "hosing" the motor with motor cleaner. With an assembled motor, there's a chance (especially with off-road cars) that dirt will be flushed *into* the bearings and farther *into* the motor. This will accelerate wear, and all your work will be for naught. One light shot of cleaner on the comm will be enough. Save the bath until you've disassembled the motor. A single drop of oil on the motor bearings and a drop or two of commutator lubricant on the brushes and commutator should have your motor ready for the next heat—running just as strongly as it ever did.

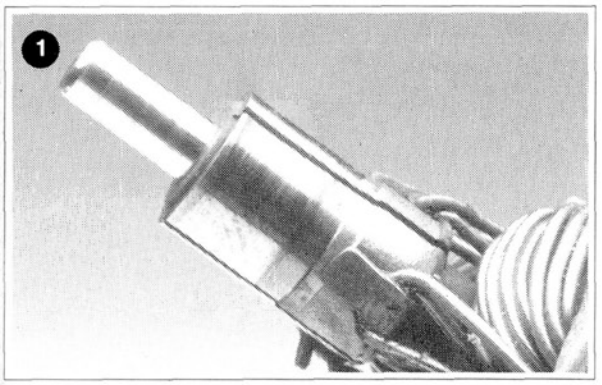
Another of my "don'ts" concerns the use of motor-dipping solutions, in which you dip motors while they're running. They clean your motor, but I think they make it *too* clean! Not only do these cleaners remove dirt, but they also take the natural lubricants out of the commutator and the brushes!

TEARIN' IT DOWN!

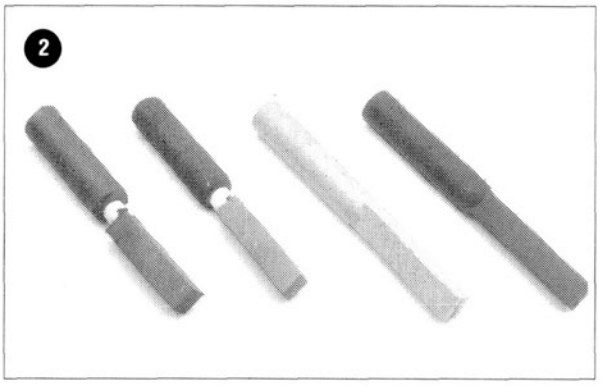
Between races, you can take a few more steps to prolong the life of your motor even further.

If you have plenty of time to work on your motor, clean it more

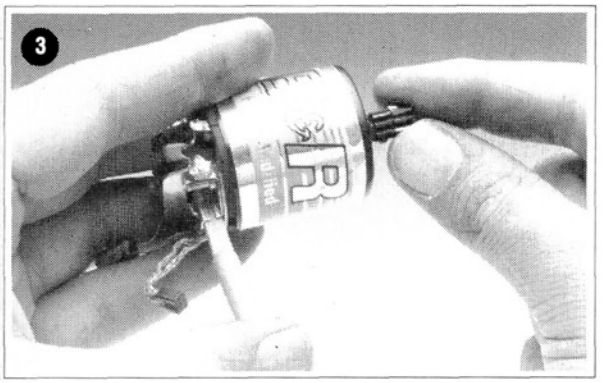
MODIFIED MOTOR MAINTENANCE



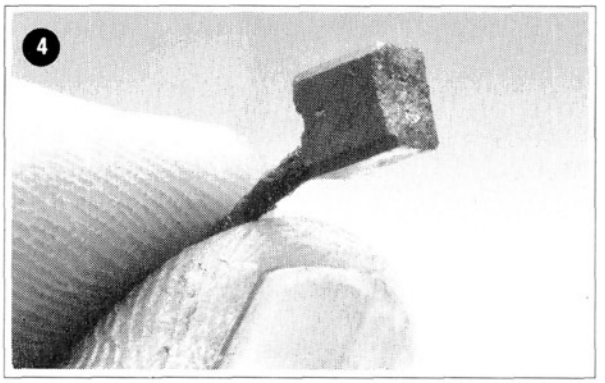
A close inspection of your motor's commutator will reveal whether the motor needs maintenance or a complete rebuild. This motor shows signs of wear, but it can be cleaned and run a few more times.



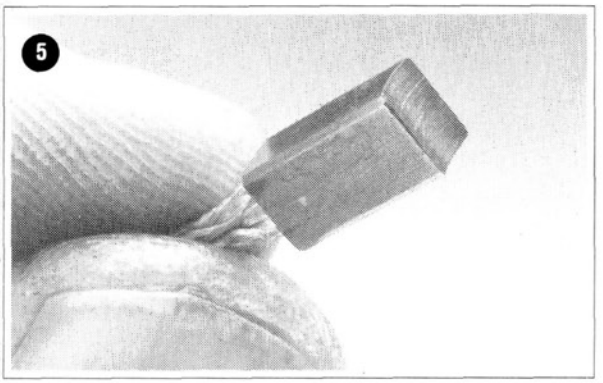
These Edge Products and Trinity commutator cleaning sticks help you to keep your motor in good shape between rebuilds.



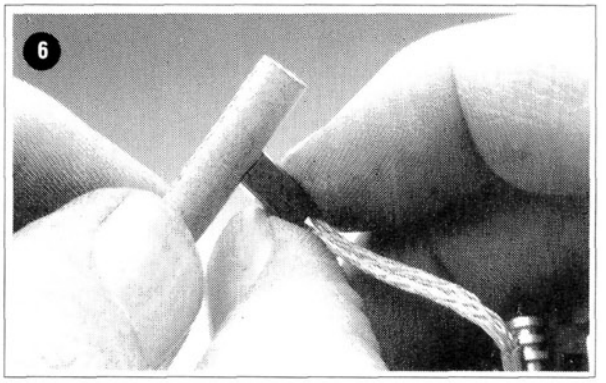
When using a comm cleaning stick, apply very light pressure while manually spinning the motor.



This shows the damage that can result from modified-motor neglect. The brush was so short that the spring could no longer hold it firmly against the comm, and this led to heavy pitting of the brush and the commutator.



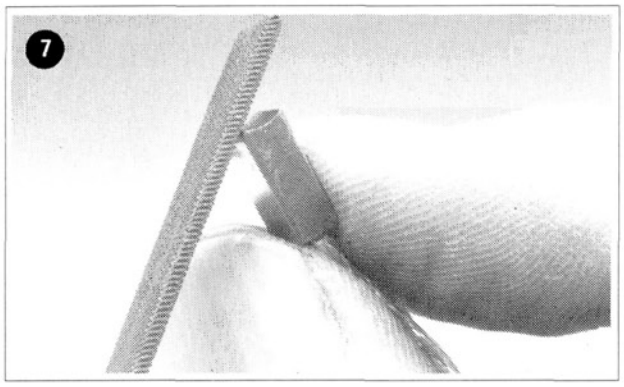
This hard-compound brush has been used for six runs. It's certainly worn and beginning to affect motor performance, but with a quick cleaning, the motor can be brought back to life.



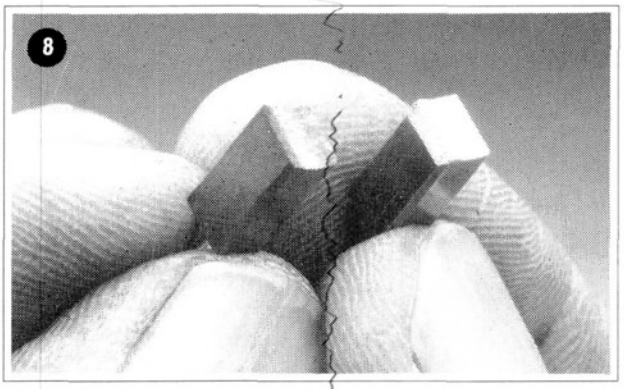
Clean the face of the brush with the round end of a comm cleaning stick.

thoroughly. You'll have to take it apart, but when you've done it a couple of times, it will be routine. This type of cleaning isn't as critical for motors used in on-road cars because their environment is cleaner, but for off-road motors, cleaning is essential if retaining maximum performance is high on your priority list.

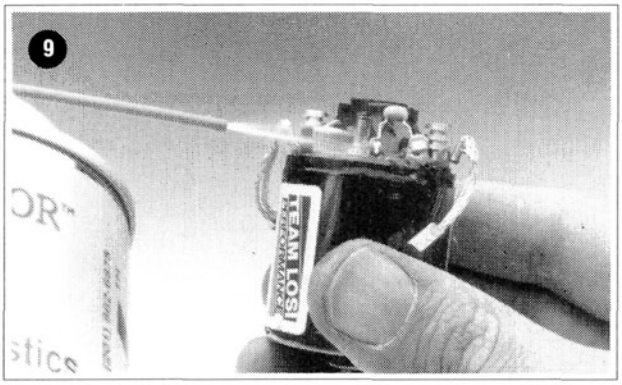
Before taking your modified motor apart, make a mark on the end of the motor can that's nearest to the endbell to show where the timing is set. The timing marks are usually cast in the endbell, just below the screws that fasten it to the can. To ensure that you don't install the endbell backwards when you re-assemble the motor, mark the side of the can that faces the positive part of the endbell. Mark the can with an engraver or any other instrument that



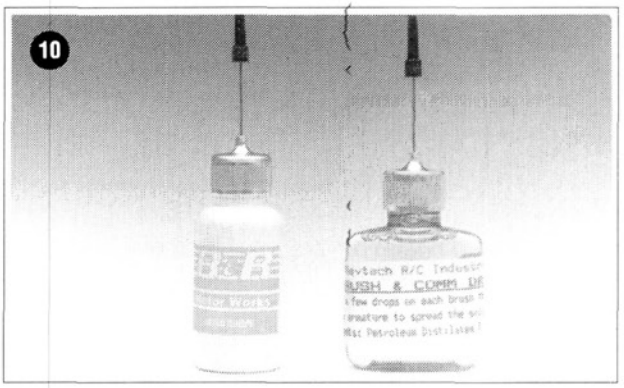
Using a small, flat file at a 45-degree angle, chamfer the trailing edge of the brush. To remove burrs, lightly file the leading edge of the brush, too.



This "before and after" picture shows the brushes from one motor. The one on the left is untouched after six runs, and the one on the right has been properly reconditioned.

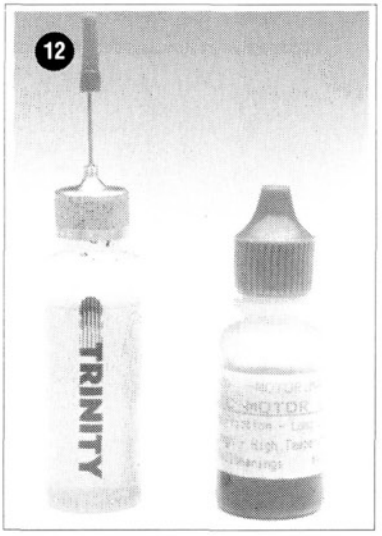


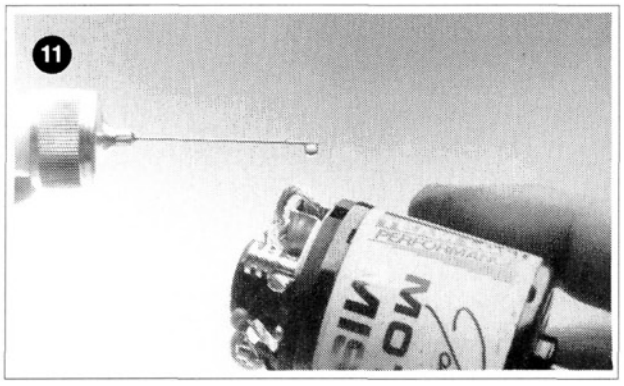
For trackside commutator spray cleaning, use one short blast; don't flood your motor. This will prevent dirt and debris from being washed onto vital motor parts.



Above: These B&R and Revtech "comm drops" are examples of the wide variety of available conductive commutator lubes.

Right: These Trinity and Revtech oils are just two of the many available bearing lubricants for modified motors.





After each cleaning, apply a single drop of comm lube to the rear of each brush. The lube will then slowly seep through the hood and onto the commutator.

can scratch metal (even "permanent" magic marker can be wiped off with motor-cleaning spray).

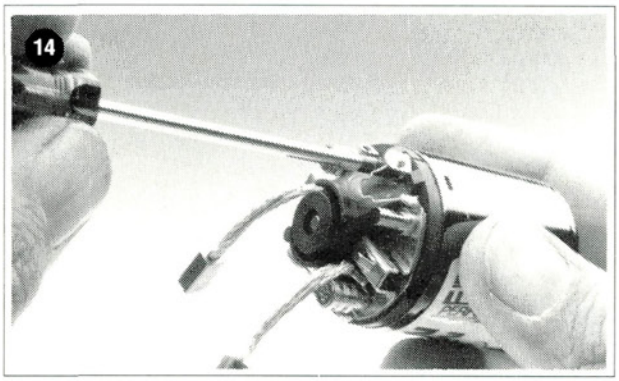
After making the proper marks on the can, take the brushes and brush springs off the brush hoods, and inspect the brushes to see whether they should be replaced. Most new brushes are approximately 3/8 inch long, and if they're worn by more than 1/8 inch, they should definitely be replaced.

Next, remove the endbell. Loosen the two screws on either side of it just enough to allow it to rotate freely (about three turns of the screwdriver). If it still sticks, press down on the screws lightly and try to rotate the endbell again. Turn it clockwise while pulling it up slightly, and the endbell should come right off the can.

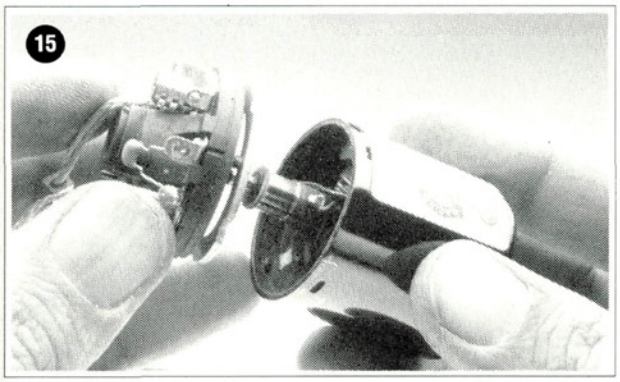
If you're still having trouble removing it, simply take out the screws com-

MODIFIED MOTOR MAINTENANCE

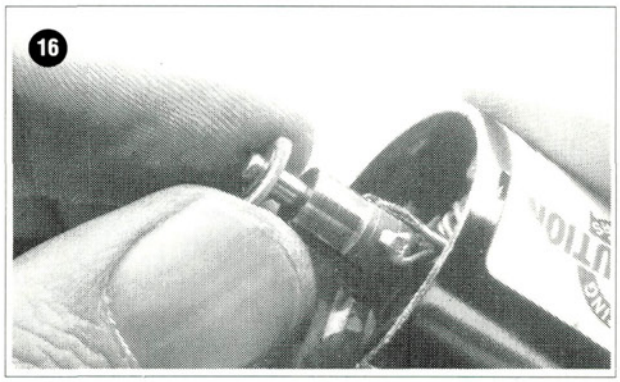
To help you reassemble your motor correctly, mark the motor's can to indicate timing points and polarity.



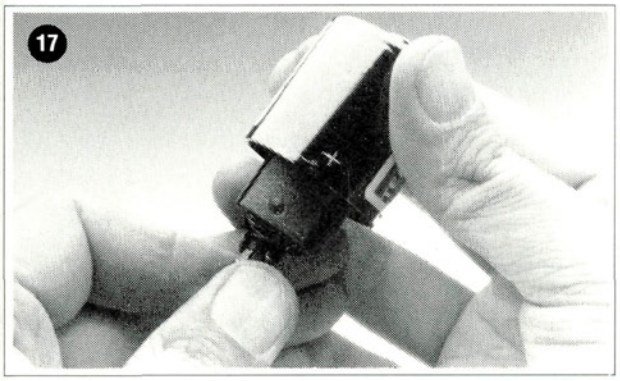
To remove the endbell, first remove the brushes and springs and loosen the screws.



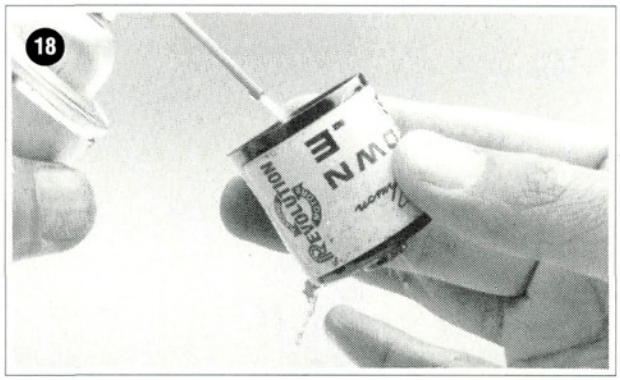
While pulling slightly upward, rotate the endbell clockwise to separate it from the can.



Remove the shims on the shaft just above the commutator, and put them in a safe spot to avoid losing them.



Turn the can upside-down and pull the armature out. Take the shims off the bottom of the shaft and put them with the other shims; don't confuse the two groups of shims!



Use a liberal dose of motor cleaner to clean the motor bearings and other components from the inside.

pletely and pull the endbell off. (Afterwards, retrieve the retaining ring with a pair of needle-nose pliers.) Work over a clean surface that's covered with a towel to catch any shims that might fall out of the motor.

Placed over the shaft that runs through the motor, these shims are used to center the armature in the can. Put the shims that come off the top of the armature (closest to the comm) on one side of your work table, then take the armature out of the can and put the shims that were on the bottom of the armature on the other side of the table. Now, thoroughly hose the motor and bearings.

To clean out the accumulated dirt and debris, spray liberally from the *inside* of the can and the endbell. By spraying from the *inside*, you'll flush the dirt toward the outside, instead of further inside.

BRUSHIN' UP

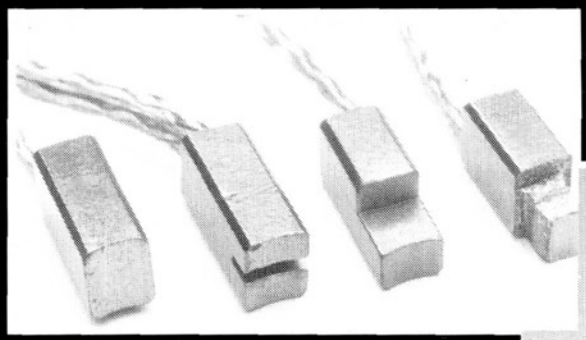
Clean, fresh brushes have always been important in the preservation of your modified motor's performance, but which of the available types is best?

I've found that there isn't a tremendous difference between the performance of a modified motor that uses an exotic cut and one that uses a standard full brush. In certain applications, a cut brush might give a slight improvement in performance, but this advantage can be neutralized by going too wide in just one turn!

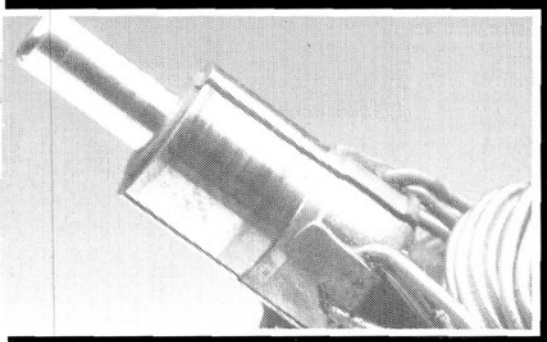
wear is distributed over a larger area, and this helps to extend the life of your motor.

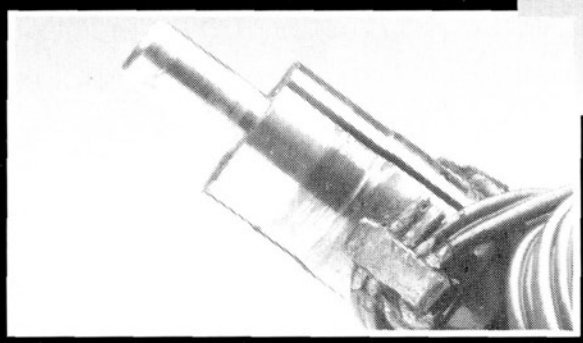
If you take my advice about running a full brush, which compound should you use? Brushes are available in two compounds—hard and soft—and each has good and bad points.

Soft-compound brushes transmit current well and prevent commutator wear. They wear very quickly, however, and they tend to reduce maximum rpm. Hard brushes allow



Left: A standard, full brush that's commonly used in modified motors and three versions of cut brushes. The nominal performance improvement isn't worth the wear and tear caused by a cut brush.





Above: With a full brush, the load is evenly distributed over the face of the commutator. This significantly extends commutator life and time between rebuilds.

Left: A cut brush was used on this armature. The wear toward the bottom of the comm occurs much faster than when using a full brush, and this requires more frequent rebuilds.

Cut brushes were developed for use in the stock class, where reducing the amount of the brush that touches the commutator (to allow the motor to rev a little higher) is about the only legal way to make your motor run faster. With modifieds, however, you have an endless choice of winds and tuning options to enhance performance, and in my opinion, this eliminates the need for cut brushes.

Using a cut brush in your modified motor has an adverse effect—accelerated commutator wear. On one of the most popular cut brushes (commonly referred to as an "off-road cut"), half of the contact surface has been cut away. The pressure applied to the commutator is doubled, and this means that it wears twice as fast. With a full-face brush, your motor to rev faster and last longer, but they increase commutator wear and as conductors, they aren't as good.

Another variety was recently introduced: the "silver" brush. It has a high silver content, and silver is the best-known conductor of electricity. The samples I've seen are of a very hard compound, yet they still manage to conduct extremely well. Silver brushes offer the benefits of both types of standard brush, but the hard compound will still cause commutator wear.

Whichever compound is used, in a modified motor, I prefer a full brush. The minimal increase in performance that's provided by a cut brush isn't worth the substantial reduction in motor life.

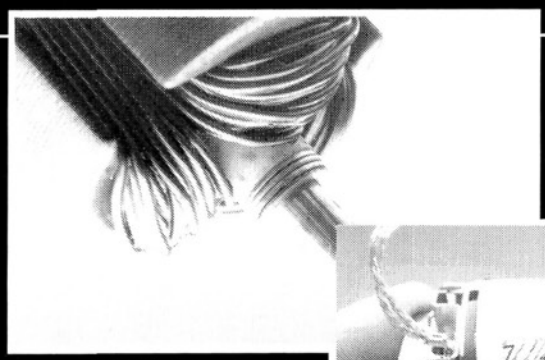
Only after doing this should you direct the cleaner *toward* the bearings from the *outside*. A quick shot of compressed air will remove any remaining cleaner or condensation that resulted from it.

A small drop (yes, only one!) of light oil on each bearing will have these motor parts ready for reassembly. If they look worn, touch-up the brushes with a file and a comm stick. A quick shot of motor cleaner will flush the dirt off the windings on the armature, and that's the final step before you reassemble the motor.

Slide the correct shims over the bottom of the armature shaft, and put it into the can. To prevent the spacers from sliding off the shaft, it's best to turn the motor can upside-down before you slide the armature in. The magnets inside the can will pull the

DO THE SHIMMY SHIMMY SHAKE

Have you ever taken apart a modified motor and forgotten the order in which you should replace the shims that come off the top and bottom of the armature? You probably just guessed where they should go, but their position is very important.



Left: The shims inside modified motors are used to center the armature in the magnetic field. The number of shims depends on the magnets' positions.

Right: To determine the number of shims needed on top of the armature (nearest the commutator), repeat the procedure, but this time, push the shaft toward the top of the motor.

Motor shims have a purpose, and it's not to center the brush on the commutator. Shims not only prevent the armature from moving back and forth in the can, but they also keep it centered in the magnetic field.

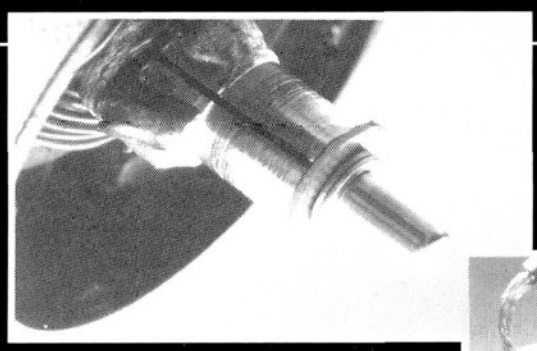
When you remove the armature from the can, you'll feel substantial resistance, because you're pulling it away from the center of the magnetic field. When the motor shims are installed properly, they keep the armature centered in this field. Improper shim installation results in the armature continually trying to pull itself into the center of the field. This puts a constant load on one of the motor bearings, and this causes excessive friction and premature bearing failure.

To determine where the shims should be placed, assemble the motor without them, and don't tighten the endbell. Keeping the endbell in place with a finger, hold the motor horizontally and spin it to allow the armature to find the center of the magnetic field. When the armature comes to a stop, pull it toward the bottom of the can by grabbing the shaft where the pinion is attached.

The amount the armature moves before it hits the bearing will determine how many shims you should use on that side of the shaft. The position of the magnets in the can determines where the armature will be centered. This varies from motor to motor: it might take one shim, or it might take three.

If there's little or no movement when you pull on the shaft, it's still important to use at least one very thin metal shim. Take the armature out of the can, and place a shim over the bottom of the shaft. Put the armature back in the can, replace the endbell, and spin the motor again. To determine whether another shim is necessary, pull the shaft toward the bottom of the can. Repeat this procedure until there's very little movement when you pull the shaft toward the bottom of the can.

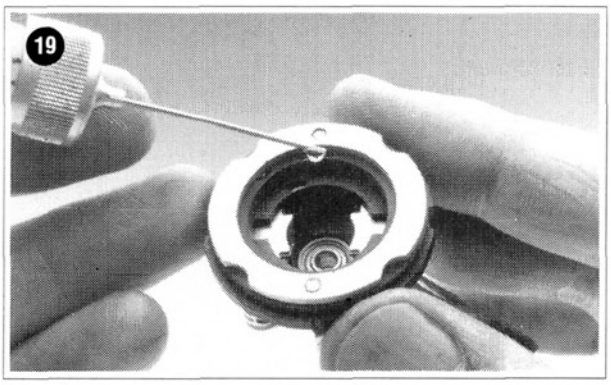
Now, repeat the procedure to determine how many shims are needed on top of the armature near the commutator. Spin the motor to center everything, only this time, push on the shaft while firmly holding the endbell in place on the can. Repeat this process, adding one shim at a time, until movement is very limited. Tighten the endbell with the timing mark in its proper position, and check the motor end play to make sure there's still a little armature movement. It might take you a few tries to get this operation down pat, but when done properly, it will enhance your motor's performance and prevent premature bearing failure.



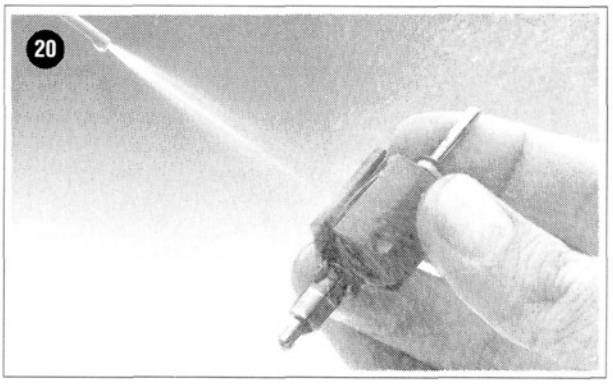
Left: The number of shims on the bottom of the armature also depends on the placement of the magnets. The armature will often bottom-out in the can before it reaches the center of the magnetic field, but it's important to have at least one shim on the shaft.

Right: To determine how many shims are needed on the bottom of the armature, assemble the motor without shims, and with the motor in a horizontal position, spin the shaft while holding the endbell on with your finger. When the armature comes to a stop, pull the shaft toward the bottom of the can. The degree of movement will determine the number of shims needed. Add one at a time until there's little or no movement when you pull on the shaft.

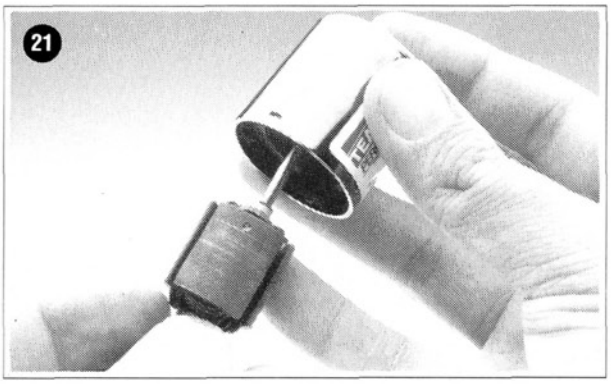
MODIFIED MOTOR MAINTENANCE



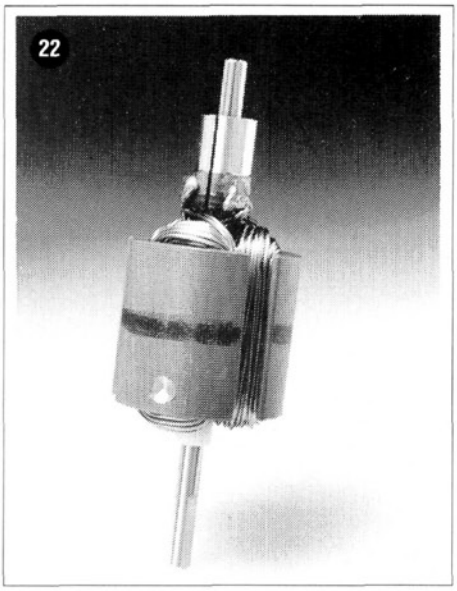
When all the parts have been thoroughly cleaned and are dry, lubricate the bearings with a lightweight oil.



To ensure peak performance, also clean the armature well with motor spray.



When the motor's components have all been properly cleaned, put the shims back on the shaft in the correct places and reassemble the motor. Be sure to lubricate all moving parts properly. (See text.)



You'll inevitably have to rebuild your motor at some point, but when you've finished, you'll have as much horsepower as you started with.

armature up into place. Slide the remaining shims over the top of the motor shaft, and put the endbell back into place. Line up the timing marks on the endbell with the marks you made on the can, and tighten down the endbell. Again, put a drop of commutator lube on the comm, and your motor will be primed for the next race!

REBUILDING

No matter how well you take care of your motor, it will inevitably have to be rebuilt at some time. How you use your motor plays a big role in how often it has to be rebuilt. It takes a little experience to know exactly when it's time, but the tips I gave earlier should provide a good starting point.

When you've determined that you have to rebuild your motor, you have two options: send it to a motor manufacturer or a hobby shop that offers this service, or do it yourself, with one of the many available commutator cutting machines. Which should you do?

The advantage of sending the motor away to be rebuilt is that it comes back to you ready to go, and most manufacturers and better-equipped hobby shops have machines to recondition the magnets (and there's no need to read the rest of this article!). The down side is the time it will take to ship the motor there and back. If you do it properly, you should be able to do it yourself more quickly, but the magnets won't be "zapped," and you'll have to bear the cost of a comm cutting machine.

The same maintenance and assembly tips apply to rebuilding a motor, but this time, the motor will be reassembled with a new commutator. I strongly recommend that you install a new set of brushes, too—regardless of the condition of the old brushes.

Horsepower is the name of the game. If you want to race in a modified class with a dependable motor, regular maintenance is important, so don't neglect it. ■

JRX-PRO

(Continued from page 119)

working as well as I thought it could. During assembly, I had tightened the diff in small increments until there was little, if any, slip, so I thought the solution lay elsewhere.

I narrowed the problem down to the new diff lube that's included in the kit. It's very viscous, and you're supposed to apply it lightly to the holes in the diff gear where the diff balls go. I had my reservations about using this lube, but I decided to give it a shot because it came with the car. I found that the heavy lube slowed the diff action, and this limited the Pro's cornering ability. I applied the less viscous VRP* diff lube, and after that, I had a much more responsive diff.

Subsequent, thorough tests netted some nearly flawless runs—apart from those caused by driver's errors! The car was predictable and much more aggressive through turns than the original X2. The H-arms really help the Pro take turns on a tight line (even with its extended wheelbase). I found, however, that the aggressive handling characteristics that are so beneficial on high-traction tracks can be detrimental on a very slippery surface. On a hard-packed track, it takes a little extra tuning to get the Pro nailed to the surface. I'm not saying that it can't be done, but in the kit configuration, the car is a little loose, even with milder motors. Fortunately, Team Losi had enough foresight to allow the use of its five-link rear suspension (available as an option), which is well-known for its good traction on slippery surfaces.

SO HOW'D IT DO?

The bottom line? With the numerous, subtle changes made by the Losi crew, the JR-X2 has been transformed into one of the most versatile 2WD racing machines available. The JRX-Pro is extremely responsive to even slight changes. Even my early, minor problems have to be kept in perspective. The 12-turn Motown Missile motor provides more horsepower than I've ever strapped into a 2WD car! Under normal circumstances and at more conservative speeds, the car will be more than manageable, even when driven by someone with less experience.

It's not too often that I can take a car out of the box, build it this easily, and have it handle as well as cars I've worked months on. Don't misinterpret me; this *isn't* a slot car, and you can't mash the throttle and expect it to drive itself. You'll still have to rely on proper tuning and skillful driving to extract the Pro's maximum performance potential; but, if there ever was a race car that could put your skills to the best use, this is it. The Losi JRX-Pro is the best overall 2WD racing machine I've ever tested.

**Here are the addresses of the companies mentioned in this article:*
Team Losi, *1655 E. Mission Blvd., Pomona, CA 91766.*
Kimbrough Products, *1430 East St. Andrews Place, Unit F, Santa Ana, CA 92705.*
Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.*
Tekin Electronics, *970 Calle Negocio, San Clemente, CA 92672.*
Trinity, *1901 E. Linden Ave., Linden, NJ 07036.*
VRP Inc., *4555 Groves Rd., #15, Columbus, OH 43232.* ■

KYOSHO HURRICANE

(Continued from page 96)

care to avoid getting it on any plastic parts!

Servo tray: this is straightforward and needs no explanation. I only had difficulty

(Continued on page 140)

KYOSHO HURRICANE

(Continued from page 136)

with one set of servo-mounting screws. There's so little room between the servo and one of the radio wells that I found it easier to install the screws upside-down with the nuts facing upward. After mounting the speed controller, epoxy the whole unit into the hull (hold it with tape until the epoxy has cured).

Decals: these Mylar stick-on decals are the best I've seen. The colors are striking and the print registration is "right on." Wet the hull with soapy water, slide the decals into place, then use a small piece of balsa wood to squeegee the water out. Try it; it's easy.

Final assembly: now you only have to paint and glue on the driver's head, the throttle-man's head, the antenna tube and the hand rails. I didn't install the rails, because I always break off this type of

(Continued on page 150)

Second Look Series

ASSOCIATED

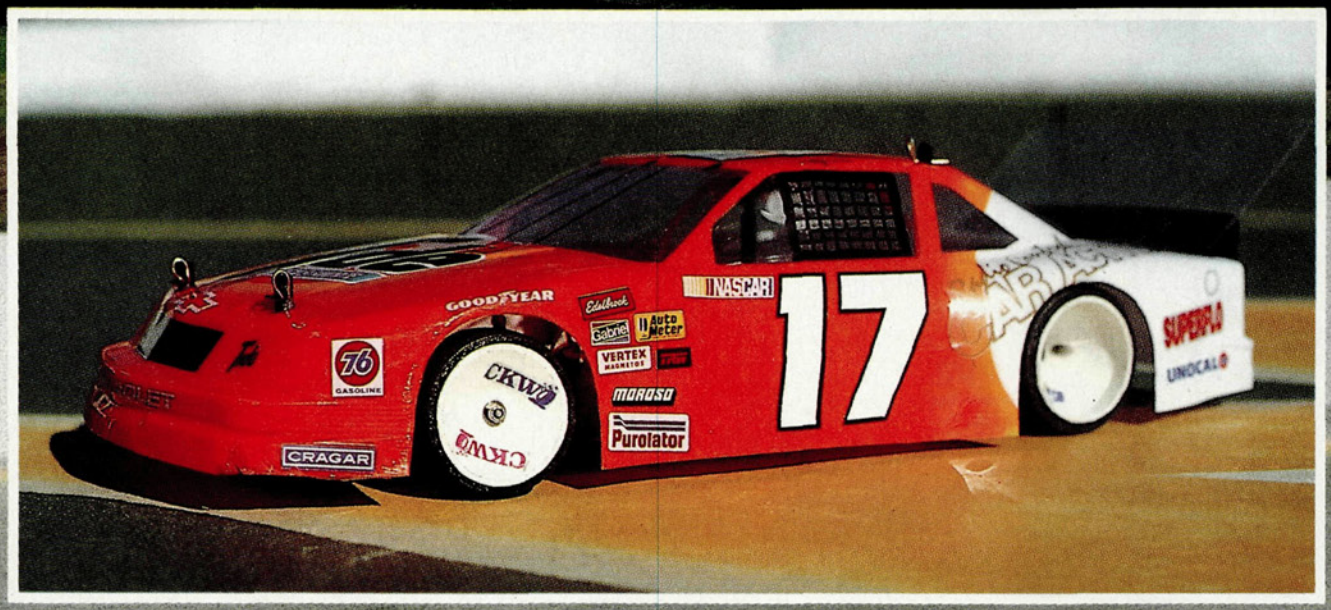
RC10L SPEED FEED

by STAFF

THE ASSOCIATED* RC10L had a reputation long before it became available to the public. The prototype's accomplishments were quite impressive: it took the TQ honors at the ROAR Nationals, after which nine more prototypes were built for the rest of Team Associated. The 10L then cleaned up at the ROAR Region 6 Championships, taking TQ in Stock and Modified and winning both classes. Eight 10Ls placed in the Stock Class and seven in the Modified Class. In the car's third race, Kent Clausen set a national speed record of 56.5mph at the RC Thunderdrome (Encino Velodrome, CA). After a wait that seemed interminable to many, the RC10L was finally released in kit form.

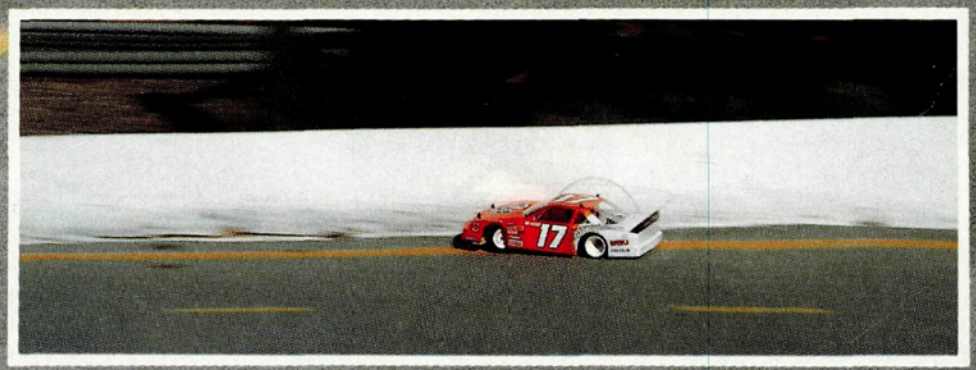
THE KIT: For this review, I received the RC10L Graphite Kit, which has a graphite chassis. The Fiberglass Kit comes with a fiberglass chassis, and both chassis have five battery slots on each side for saddle-pack configuration. The front end consists of two nylon suspension arms with a graphite plate between them to increase rigidity. Coil springs on the kingpin absorb bumps in the track, and E-clips hold the wheels on the front axles. Nylon shims are included to add caster, if needed. The rear suspension uses an offset T-bar that's mounted to the chassis with twin rocker balls. Dampening is provided by an oil-filled, coil-over shock, which many will recognize as an RC10 front shock. The shock is attached to the chassis by a

Great Expectations



combination antenna mount/shock pivot, and is then connected to the top of the graphite rear pod with a ball joint.

The rear pod pivots on the T-bar system, its side-to-side movement controlled by two damper plates, one on each side of the motor pod's upper bracket. The pod is offset so that the motor can be located toward the center of the chassis. The 10L is topped by a graphite axle with aluminum hubs. Two ball bearings and three thrust bearings provide smooth differential operation.



ASSEMBLY: I've owned an RC10 for two years, and I've built manyAssociated kits for other people, so I've come to expect a well-organized assembly process spearheaded by a clear, concise manual with well-executed photographs. When I opened this kit's manual, I wasn't disappointed. In the photos, the parts were clearly numbered and arrowed, so I was in no danger of going blind trying to find the right ones!

Assembly starts with chassis preparation. To avoid slicing through the shrink wrap of the cells, use a small file or a Dremel* Moto-Tool to round off the rough edges of the battery slots. As an additional precaution, wrap a small amount of electrical tape around the graphite between each slot. Any tear in the shrink wrap could cause a short because graphite can conduct electricity. Also, to prevent the strapping tape from being cut, file the edges of the chassis where the tape will go.

I made a modification to the chassis that you may want to consider if you go oval racing. While there's much debate about the need to offset the batteries on the inside of the car, I had a more practical reason for running my batteries along my car's left side: all my packs were in stick configuration! There's no way to run the packs across

(Continued on page 147)

ASSOCIATED
RC10L

Type ..... On-road
Scale 1/10
Sug. Retail Price $235

DIMENSIONS:
Overall Length ..... 20 inches
Width ..... 9.25 inches
Height ..... 5 inches
Wheelbase ..... 10.25 inches
Front Track ..... 7 inches
Rear Track ..... 7.25 inches

WEIGHT:
Gross (w/bat.) ..... 44 ounces

BODY:
Type ..... Not included

CHASSIS:
Type ..... Pan
Material ..... Graphite

DRIVE TRAIN:
Primary ..... Pinion/spur
Transmission ..... Direct drive
Differential ..... Ball
Bearings ..... Ball bearings

SUSPENSION:
Front: Type ..... Suspension arms
Dampening ..... Coil spring
Rear: Type ..... T-bar
Dampening .... Oil-filled, coil-over shock w/dampener plates

WHEELS:
Front: Type ..... One-piece nylon
Dimensions (DxW) ..... 1.8x1.125 inches
Rear: Type ..... One-piece nylon
Dimensions (DxW) ... 1.8x2 inches

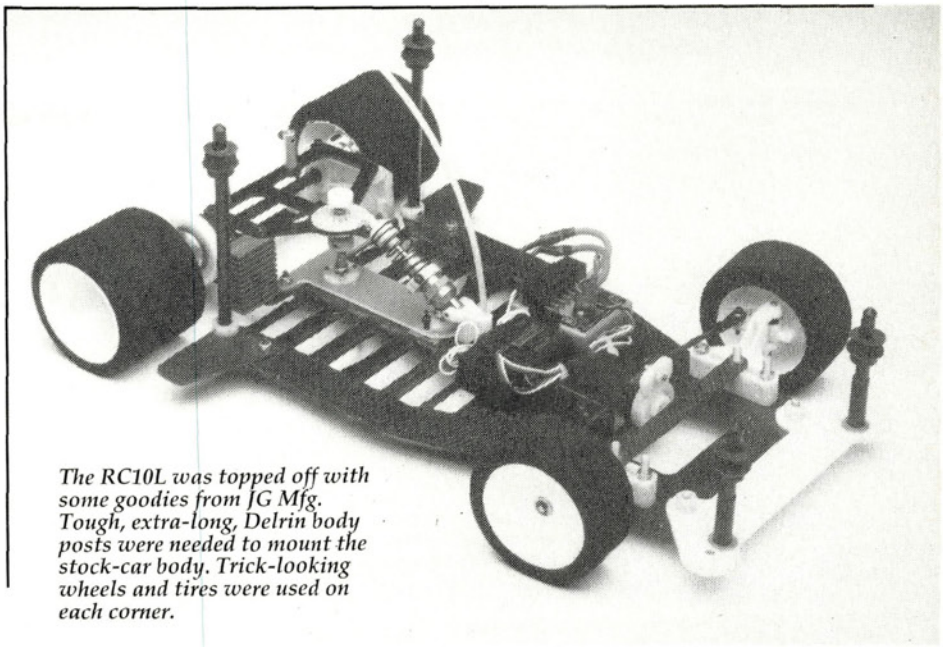
TIRES:
Front/Rear ..... Foam

ELECTRICS:
Motor 05/540*
Battery ..... 6- or 7-cell*
Speed Controller ..... Electronic*

OPTIONS AS TESTED:
Futaba Magnum JR radio; Novak T1X electronic speed controller; Reedy Modified Yellow Dot motor and 6-cell SCE Team pack; Associated Chevy Lumina; Scale Racing Products center-point steering; JG Mfg. foam tires, body posts, and graphite lower pod brace; CKW cap tires.

COMMENTS:
The RC10L worked right off the work table. It can be placed anywhere on the track, and it almost broke the track record on its first time out.The car stays very consistent from track to track, without needing adjustment. I hope the broken T-bars and axle were due to a tough track. Overall, a good value/performance ratio.

* not included



The RC10L was topped off with some goodies from JG Mfg. Tough, extra-long, Delrin body posts were needed to mount the stock-car body. Trick-looking wheels and tires were used on each corner.

the chassis, so I enlarged the small slot for the strapping tape (toward the front of the chassis) to the size of a battery cell. This allowed me to have all six cells on one side of the chassis. I cut a new slot to allow me to tape the batteries into place.

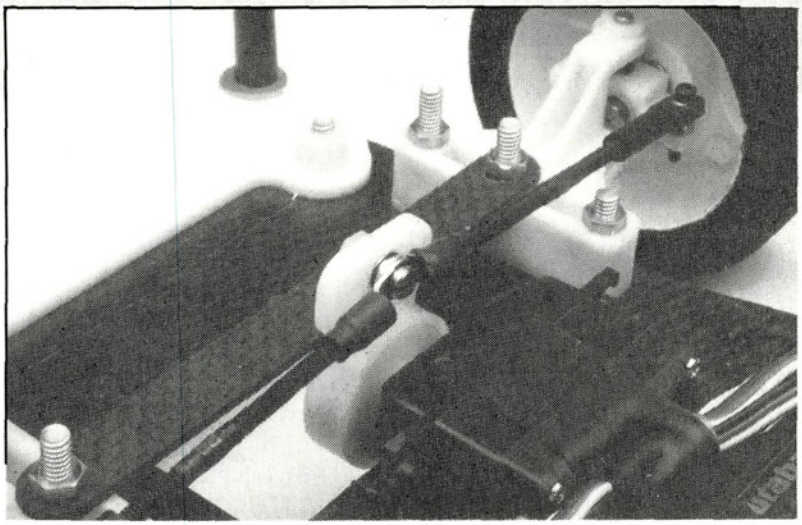
The front end is installed next. You have a choice of two bumpers: the large one is for the wide GTP or Can-Am bodies, and the smaller one is for stock cars.

I was extremely disappointed to find that the 10L uses E-clips to hold the wheels onto the front axles. I've seen E-clips fail too many times to trust a race to them. I substituted Bolink* front axles, which are threaded on the end and use locknuts to keep the wheels on. It's been said that I can "drive the wheels off a car," but I don't want to take this literally.

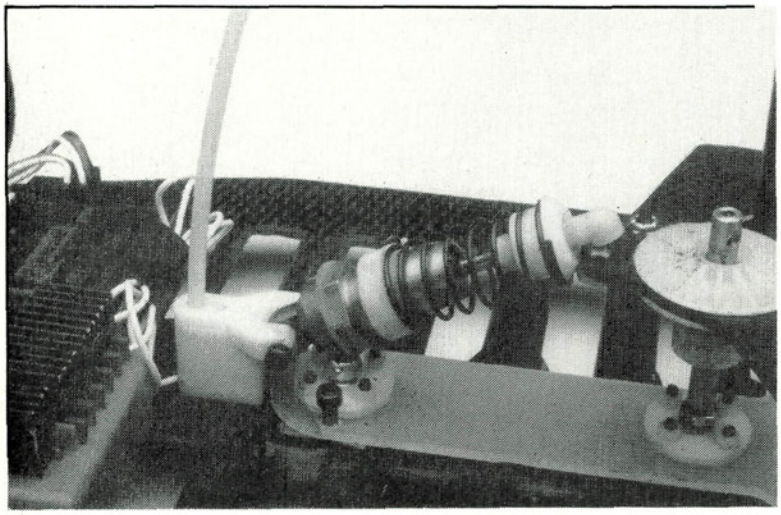
The front end is finished with tough-looking suspension arms that offer support to the top and bottom of the kingpin. No snapped kingpins on this car! The kingpins didn't need polishing to get a smooth up-and-down movement in conjunction with the small coil springs.

Each suspension arm is mounted to the chassis with three, long, aluminum screws. A nylon spacer goes between the chassis and the arm, along with a 2-degree caster wedge if needed. (Associ-

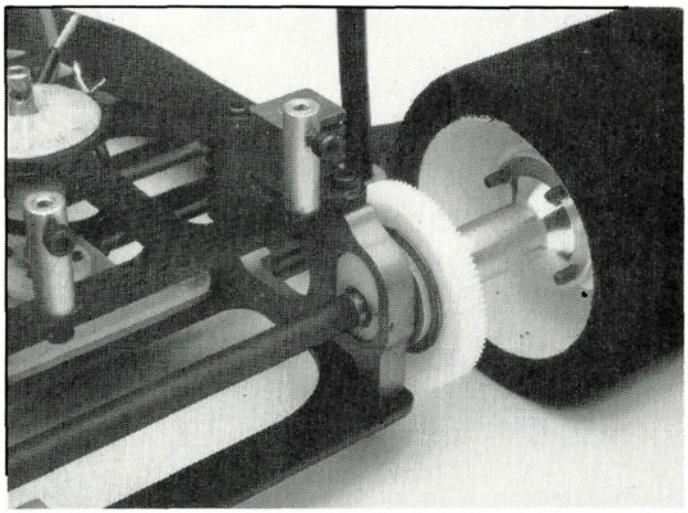
(Continued on page 148)



Beefy, center-point steering replaced the stock linkages. To clear the linkages, the bolts had to be cut. You won't have to do this if the front ride height isn't changed.



The fiberglass T-bar pivots on two rocker balls. Tweak screws, located next to the front rocker ball, are easily accessible.



The Litespeed Litesink, a bolt-on accessory, replaces the stock motor mount. The ride-height adjusters are set to give maximum ground clearance for bumpy tracks.

ated recommends that you start without any caster.)

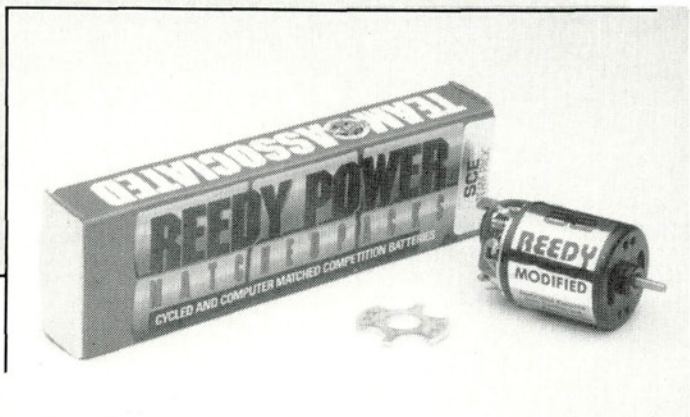
Construction continues with the rear of the car—the assembly of the T-bar and rocker balls, and their installation on the chassis. There are a couple of things to watch for in these sections:

- Don't overtighten the screws on the rocker balls, or you'll inhibit the T-bar's movement.
- The instructions' "Racers' Tips" recommends that you CA two pieces of brass shim stock where the tweak screws make contact with the chassis. Otherwise, the screws may bore into the chassis, changing the critical tweak setting.
- The aluminum tube that's the pivot point for the T-bar and dampener plates must be securely tightened on the screw that comes up through the chassis and T-bar. Although I used thread-locking compound, there was no way to tighten the tube without crushing it. I drilled a small hole through the top of the tube and inserted a small Allen wrench. This allowed me to *really* tighten the tube onto the screw and prevent it from vibrating loose.

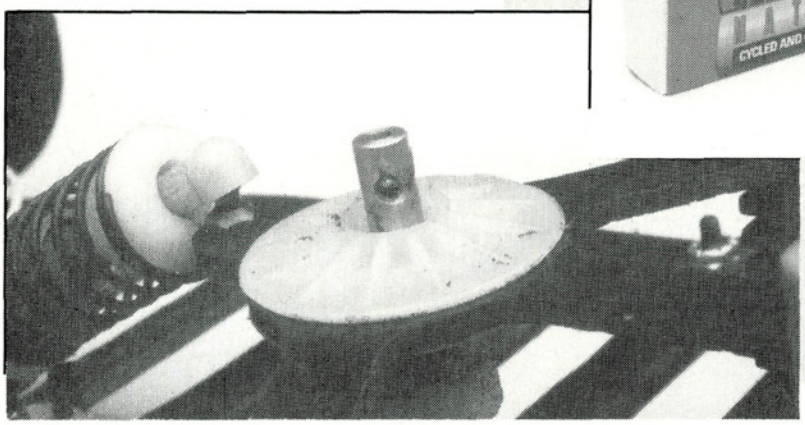
The rear pod goes together quite easily. Although the right-hand motor bulkhead is aluminum, I wanted to get more cooling for the motor, so I used a Litespeed* Litesink, which is a bolt-on part. The Litesink's big fins become warm during use, helping to dissipate heat more effectively.

Some have reported a problem with the aluminum lower brace, which can bend on bumpy tracks, throw the "tweak" way off and cause alignment problems for the rear axle. To eliminate this, JG Manufacturing* has introduced a graphite lower brace, which definitely won't bend.

Assembly continues with the graphite axle and diff; building and mounting the oil-filled, coil-over shock; and mounting the radio gear. These steps go according to the instructions.



A Yellow-Dot modified motor and a 6-cell SCE Team Pack, both from Reedy, powered the RC10L. A Sassy Chassis motor spacer kept the proper distance between the motor pinion and the spur gear.



A hole was drilled so that the post can be tightened more securely. The post had a tendency to vibrate loose before this modification was made.

For smooth differential operation, I used diff balls and silicone lube from Bud's Racing Products*, and Hyperring diff rings from Hyperdrive*. To lube the diff, I dump the balls into a 35mm film container, squirt in a little silicone lube, close the top and shake the container to coat the balls properly. I then pluck out the slipper diff balls and insert them into the spur.

I use Robinson Racing Products* white, machined, 64-pitch spur gears along with the new machined-steel pinion gears. They're available in a large range of teeth to give an almost infinite number of ratios.

The Hyperrings have a shiny side (for contact with the diff balls) and a rough side, and this precludes the need to glue the rings to the hubs. A Cheetah Racing* diff-centering kit, which has a small plastic spacer with a ridge to fit into the Belleville washer, combines with these products to make a silky-smooth diff, even when it's adjusted tightly!

I wasn't thrilled with the kit's steering links; each side uses two thin pieces of piano wire with a Z-bend at one end and a central locking collar at the other, which is used to adjust toe-in. They looked entirely too flimsy. Perhaps the team drivers don't touch the walls, but for the average racer, this setup is inadequate. I chose the center-point steering system from Scale Racing Products*. It has easy-to-adjust turnbuckles with eyelets on the servo ends that join at the center hole of the servo-saver.

Associated does include an awesome, spring-loaded Kimbrough* servo-saver that's the same size as those used on 1/4-scale cars. There's no way this thing will damage the servo, which is held to the chassis with double-sided servo tape.

To round out the RC10L, Associated sent along a painted Chevy Lumina body that's detailed to look just like Darrell Waltrip's Tide machine. I replaced the stock body posts (which are too short for stock-car bodies) with the new, machined Delrin body posts from JG Mfg. They're long enough for the high-roofed stock cars and are rock solid, yet flexible, to avoid breaking.

For power, Associated included a 6-cell SCE Team Pack and a Reedy* Yellow Dot modified motor. I used a Sassy Chassis* aluminum motor spacer to space the pinion on the motor shaft correctly. A Futaba* Magnum Jr. radio system and a Novak* NESC T1X electronic speed controller are used to guide the RC10L.

PERFORMANCE

The track test for the RC10L consisted of three phases. The initial phase took place at RC Speedworld, which is the unofficial "official" test track for the *Car Action* staff. Located just along Route 7 in Danbury, CT, RC Speedworld is a large, slightly banked, concrete tri-oval, with tight turns offering different degrees of banking and radii.

Right off my kitchen table, the 10L was dead-on. The soft-compound stock tires gave plenty of bite but were worn away after only a few runs. The track's surface was just too abrasive for these gummy tires. I switched to a set of JG Mfg. firm foam tires, which provided ample traction and lasted longer.

Because of some surface bumps, the chassis dragged on the ground in a few spots. To combat this, I removed the spacers under the front-suspension arms, and I installed the axle-height adapter with the bearing toward the chassis. These two changes raised the ride height enough to prevent any further chassis problems. I had to cut the front-suspension screws to allow the front steering rods to have proper movement.

During its first competitions, the 10L was only one section of the track away from beating the track record for most laps. The second phase of the test took place at *Car Action's* East-West Shootout at the RC Thunderdrome. Without changing the setup, I ran the car there.

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RC10L UPDATE

The 10L follows the RC10 in that there are tons of after-market components for it. It started as a larger version of the 12L, with only a few modifications to the basic design. Now you can find titanium chassis, specialized graphite chassis, new front and rear suspensions, axles and more—all developed over the past year or so.

This year, with the increased popularity of superspeedway racing, Associated has done some major work on the 10L, and a narrower, prototype version has been seen at many major events. The new version should be available by the time you read this, or soon after. The neat thing about the narrow version is its truer-to-scale appearance. If you compare the new model bodies with their full-scale counterparts, you'll notice this right away.

The new chassis is designed specifically for high-speed ovals, so how well it will work elsewhere remains to be seen. One thing *is* for sure: the 10L has already made a place for itself. Last year, at the Thunderdrome, it set the speed record (which still stands), and this year, it dominated the Superspeedway race and the Insane Speed Run. If history repeats itself, we'll be seeing the 10L and heaps of after-market parts for it for many years to come.

KYOSHO HURRICANE

(Continued from page 140)

thing with my banana-type fingers! If you use the rails, paint them silver.

I wouldn't recommend the Hurricane to a rank beginner, but anyone who has built at least one model boat shouldn't have a problem with it.

AT THE POND

With the Hurricane's batteries fully charged, you can expect about 5 minutes of full-throttle fun. I used a 6- and a 7-cell pack, and the difference between the two was about 1 minute (in favor of the 6-cell). My wife played with the Hurricane while I took some photos and, without using 100-percent throttle 100 percent of the time, she managed a run of about 6½ minutes. With a double 7-cell pack, you'd have a real "goin'" machine! The adjustments you have to make for a smooth ride are described in the instructions, but right off the bench, the Hurricane rode on the step and turned flat on a dime! All I can say is *"Wow!* This is what fast electric is *supposed* to be—*fast!"*

(Continued on page 152)

KYOSHO HURRICANE

(Continued from page 150)

**Here are the addresses of the companies mentioned in this article:*
Kyosho; *distributed by Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.*
Loctite Corp., *4450 Cranwood Ct., Cleveland, OH 44128.*
SCI Corp. of America, *P.O. Box 13099, Sarasota, FL 34278.* ■

SCOPING OUT

(Continued from page 101)

should continue to do so.

In high-speed oval racing, you run full-bore, flat-out most of the time. Under these conditions, all switching action stops, because at full throttle, the controller is turned on *all* the time.

The built-in torque control really works! I suspect that, for most applications, you'd run it wide open for maximum punch, but if a loose track makes you spin out, you can limit acceleration by "backing down" on the torque control. Tekin gives a test point: by measuring the voltage at this point (you'll need a fairly good digital voltmeter), you can record track conditions and test-point voltage readings and then always refer to your logbook and pick a good starting point for torque control.

With all ESCs that have long wires and stock connectors, you can achieve a tremendous increase in performance by shorting the battery and motor wires and replacing the connectors with high-quality racing connectors (e.g., Sermos* Power Pole connectors). The ESC 310's solid construction and good performance make it a good choice for any first-time buyer of a racing speed controller.

**Here are the addresses of the companies mentioned in this article:*
Tekin Electronics, *970 Calle Negocio, San Clemente, CA 92672.*
Sermos R/C Snap Connectors, Inc., *Cedar Corners Station, P.O. Box 16787, Stamford, CT 06905.* ■

RC10LTO

(Continued from page 86)

commands, I had to turn down the dual rate quite a lot. The hard part of this test was trying to keep the speed low enough to take some photos! With Reedy's* "Mr. E's" motor, matched SCEs and the recommended gear ratio, the punch was unreal.

After the pictures were taken, I started to

(Continued on page 159)

by MARK SYLVESTER

Four on the floor

MIP's 4WD RC10

PART I

SO, YOU SAY you have an Associated* RC10 that's sitting on the shelf collecting dust—or is it that your RC10 can't quite keep pace with the local hotshots? Are you considering a 4WD car? If you're an experienced builder, you might be interested in MIP's* SP-2 belt-driven 4x4 conversion kit for the RC10.

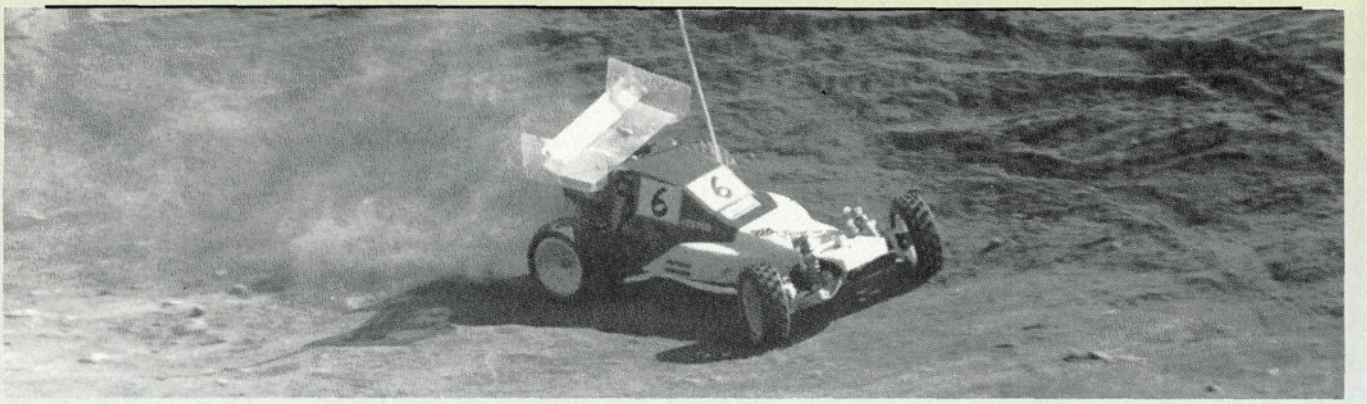
A few years ago, I saw a 4WD RC10, and I knew that some day, I'd have to have one. Because I couldn't attend this year's ROAR Nationals, my spirits were low, so to cheer myself up, I bought the kit, and am I glad I did! This car is as much fun to run as it is to build.

MIP's original 4WD kit uses a cable that's similar to a speedometer cable to transfer power to the front. This creates a whiplash effect: the rear tires receive full power before the front tires, and this tends to make the car oversteer when it comes out of a turn. MIP's next kit had a chain drive to deliver power to the front, and this was an improvement, but it still wasn't efficient enough by today's standards. The next obvious move?—a belt-version.

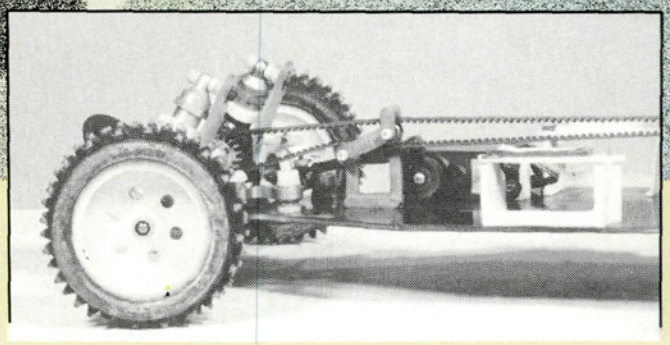
THE KIT

Become familiar with the instructions for the belt-driven kit before you begin this project. They're very well-done and include illustrations and descriptions of invaluable techniques. The kit consists of two transmissions with outdrives and belt pulleys, a belt, a belt guide, a steering link, a pair of universal dogbones, carriers, spindles and a complete set of ball bearings. Of course, you'll also need an RC10 and electrics.

I've tried a variety of chassis: one was of a non-graphite composite, which seemed too flexible for constant belt tension; another was Associated's aluminum tub. The rigidity was fine, but without extensive drilling, milling, grinding and filing, the car was just too heavy—it weighed a little over 60 ounces with a 6-cell pack. (Remember, for competition, you should be as close to 56 ounces as possible.) Also, when SCR and SCE packs are mounted side-by-



PHOTOS BY BARBARA HANSON



Locate forward belt guide hole 1 3/32 inches aft of the bellcrank mounting holes.

side, the fit is a little too tight. I finally chose Houge Enterprises'* graphite chassis, which accepts its trailing-arm kit. Chassis stiffness is just right, and the weight is now in the ballpark at 57.4 ounces.

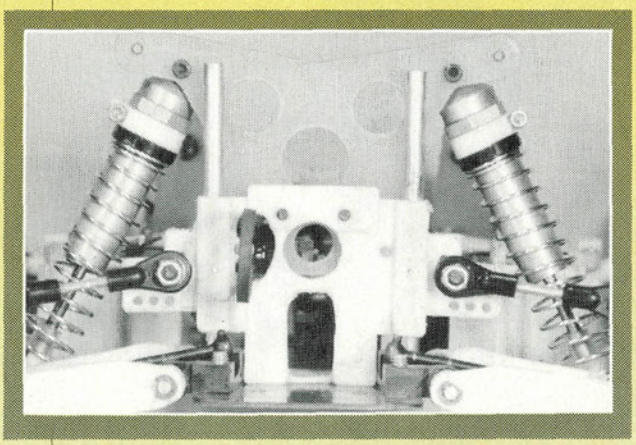
Assemble the transmissions as directed. When you mount the front outdrives, remember to install the front belt pulley, with the belt first, and please use Loctite where indicated. The rear transmission can accept MIP's new gear or Pro-Ball differentials; only one hole has to be drilled in the left, rear transmission housing to accommodate MIP's torque-control unit. I used the standard diffs that come with the kit. Drill holes for the front transmission and the steering system. MIP's template and measurements are right-on. Double-check the locations and the drill-bit sizes before you drill. Assemble and install the steering system, but make sure that you have a proper stack of washers so that the steering linkage doesn't hit the chassis. You can use Associated's servo-saver, but the car I was converting already had Team Losi's* RC10 bellcranks (no. 7009), so I used them instead.

The kit consists of two transmissions with outdrives and belt pulleys, a belt, a belt guide, a steering link, a pair of universal dogbones, carriers, spindles and a complete set of ball bearings.

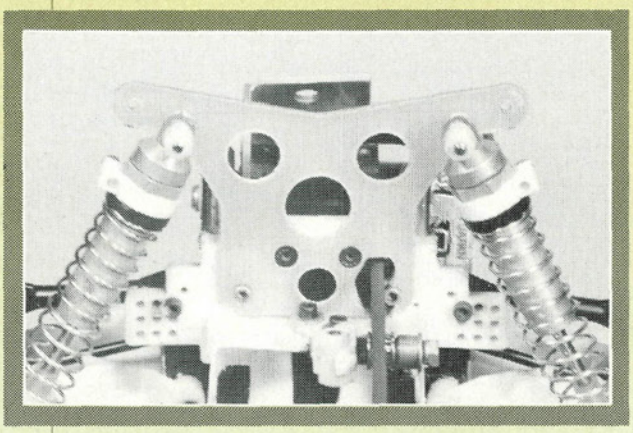
The front shock tower requires two modifications. First, notch the center section, and leave 3/16 inch of material for a 1-inch horizontal space. Then, countersink the upper suspension-mount hole in the shock tower so that there's enough clearance for the front outdrives. Before you assemble the front U-joints, bevel the inner ends of the axles and drive shafts where the cross-pins are used. A Dremel tool with a sandpaper attachment comes in handy here. If you're using

Associated's old, three-piece rims, you'll have to cut 1/4 inch off the inner sides so that there's clearance for the steering tie rods. To avoid making this modification, I used Associated's TQ rims, which have plenty of clearance between the rim and the tie-rod end.

Even though they aren't wide A-arms, Associated's stock, front A-arms must be used because of the length of the front drive shafts. At 9 7/8 inches, the front wheelbase is excellent and within legal limits.



Below: Aft side of rear bulkhead after modification.



Above: Front side of rear bulkhead. Associated front axle and steering block used as belt pulley.

The front shocks require only one modification. Use a 3/16-inch or larger piece of silicone tubing on the lower section of the shock shaft. This limits travel, but it prevents the universals from binding. MIP recommends that you use the upper hole in the stock shock tower, but I prefer the next one down. You may want to experiment here.

Two 1/4-inch holes must be drilled through the rear bulkhead and shock tower. Here again, MIP's instructions and diagrams are good, so follow them. First, drill two, 1/8-inch pilot holes, which help the 1/4-inch drill bit to go through with greater ease and accuracy. To create a slot, remove the material between the two holes with a Dremel tool or a small, round file. Next, install the rear bulkhead and shock tower. You may have to remove more material for belt clearance, so be patient; it's worth it.

After installing the belt drive in the rear transmission, position MIP's belt guide to ensure that it's in line with the transmissions. I positioned the forward belt-guide hole approximately 1 3/32 inches aft of the bellcrank mounting holes.

After completing the belt-guide installation, I found that the drive belt was chafing against the lower part of the rear bulkhead. If I removed enough material for clearance, the belt would hit the battery; this would never do! Take one Associated front axle (no. 6219) and steering block (no. 6216) left over from the front end; install two flanged bearings and one bushing on the axle; bevel the bushing so that the outer edge of the bearing doesn't touch it. Using the existing hole in the steering-block end, mark the position, and then drill a 3/32-inch hole through the top of the rear bulkhead battery cup. Secure the steering block to the battery cup with a 4/40 screw, a nut and two washers. Realign the flanged bearings with the drive belt, and drill a second hole halfway between the first hole and the large part of the steering block. Again, use a 4/40 screw, a nut and two washers. Now, check the back of the rear bulkhead. If the belt is still hitting, remove enough material to achieve clearance. The toughest part of the project is now over, so hang in there.

The battery holders are placed in almost the same position as those on the stock chassis; the only difference is that you'll have to space the battery trays an additional 1/4 inch apart (1/8 inch on each side) to facilitate battery installation and removal.

Assemble the rear A-arms and shocks to suit your driving style. I used Associated's RC10 graphite rear hub carriers. They provide increased toe-in, and this means increased traction!

THE ELECTRICS

I used a Novak* 4 and a KO Propo* EX5 with KR288 receiver and PS701 servo. (Remember, I'm re-building an older car, so I'm using some original parts.) When you're positioning the servo, be sure to leave enough clearance for MIP's belt guide. I mounted the ESC on the shock tower, but you may want a lower center of gravity. There's room for both the ESC and the receiver on the chassis, just aft of the batteries.

MIP recommends Gold springs for the front and rear, with 40WT oil in front and 30WT in the rear. It also recommends that you use a rear anti-roll bar. (I haven't used one yet, but I'm eager to try it.)

Well, it's race time! Let's see what this car can do!

PERFORMANCE

• First Qualifier: My car easily picked its way through the first-turn pileup, and I found myself in the lead. After two hairpin turns and three jumps, a huge smile crept onto my face: this car really handles! At about the halfway mark, it slowed down. Ouch! Apparently, I'd chosen the wrong motor or gearing. One car passed me on the main straightaway, but it couldn't shake me on the tight turns and infield jumps. Oh well, first qualifier: 2nd place.

(Continued on page 198)

(Continued from page 152)

open this monster up. Its top speed was just as impressive as its punch; in fact, the car was too fast for this track. On one pass at top speed, I hit a small, wet spot and didn't make the turn. Unfortunately, the right rear wheel hit the wall first, and this bent the axle. Nerf wings on the chassis might have saved the axle, but there was no room for them. The axle wasn't bent too badly, however, and we continued the test at slower speeds. At least, the axle was still in one piece—a graphite axle would have been severed, and this would have ended the test.

With these modifications, the 10LTO ought to do very well on a flat, oval track. The car handles differently with the offset chassis, so it takes some getting used to. I can't wait for someone to try to destroy my spur during a race, because HPI's pod plate makes it next to impossible. Even though the Reedy motor was too fast for the Danbury track, it should be a great performer on bigger tracks, e.g., Thunderdrome or Megatrack. Don't get me wrong—I'm not one to complain about a motor being too

(Continued on page 164)

Northern stormin'

Canadian OFF-ROAD nats

by MIKE HICKS

CANIFTON, Ontario, Canada is about 120 miles northeast of Toronto. To find this sleepy little town on a map, you'd have to look hard, but on the weekend of July 1, 1990, Canifton's Quintrax Speedway was the scene of one of the friendliest American invasions in history!

Two Californian R/C gunslingers named Junior Losi and Jumpin' Jack Johnson moseyed into town, unpacked their weapons and made off with a whole lot of loot and about 400 new friends. In fact, Canada's 2WD Stock, 2WD Modified and 4WD Modified Championships were all victims of Jack Johnson's smokin' gun. Now, don't get the wrong impression—the competition didn't give up without a helluva fight!

Canadian racers such as Scott Reid, Mike Boekdrukker, Dave Meredith, Glen Tonogai and Francois Bergeron did more breathing down Team Losi's neck than eating their dust. The presence of Gil Losi Jr. and Jack Johnson, however, proved to be the icing on the cake of an extraordinary racing event!

A BULLETPROOF EVENT

The 1990 Canadian National Off-Road Championships (brainchild of Quintrax owners Dan Reid and Russ McPeak) might go down as one of the most bulletproof, best-organized, Off-Road Nats in North American history—that's tricky when you're dealing with 255 2WD competitors, 140 four-wheelers and 70 monster trucks for a three-day total of 465 R/C racers hailing from California to Calgary to Trois-Rivieres, Quebec!

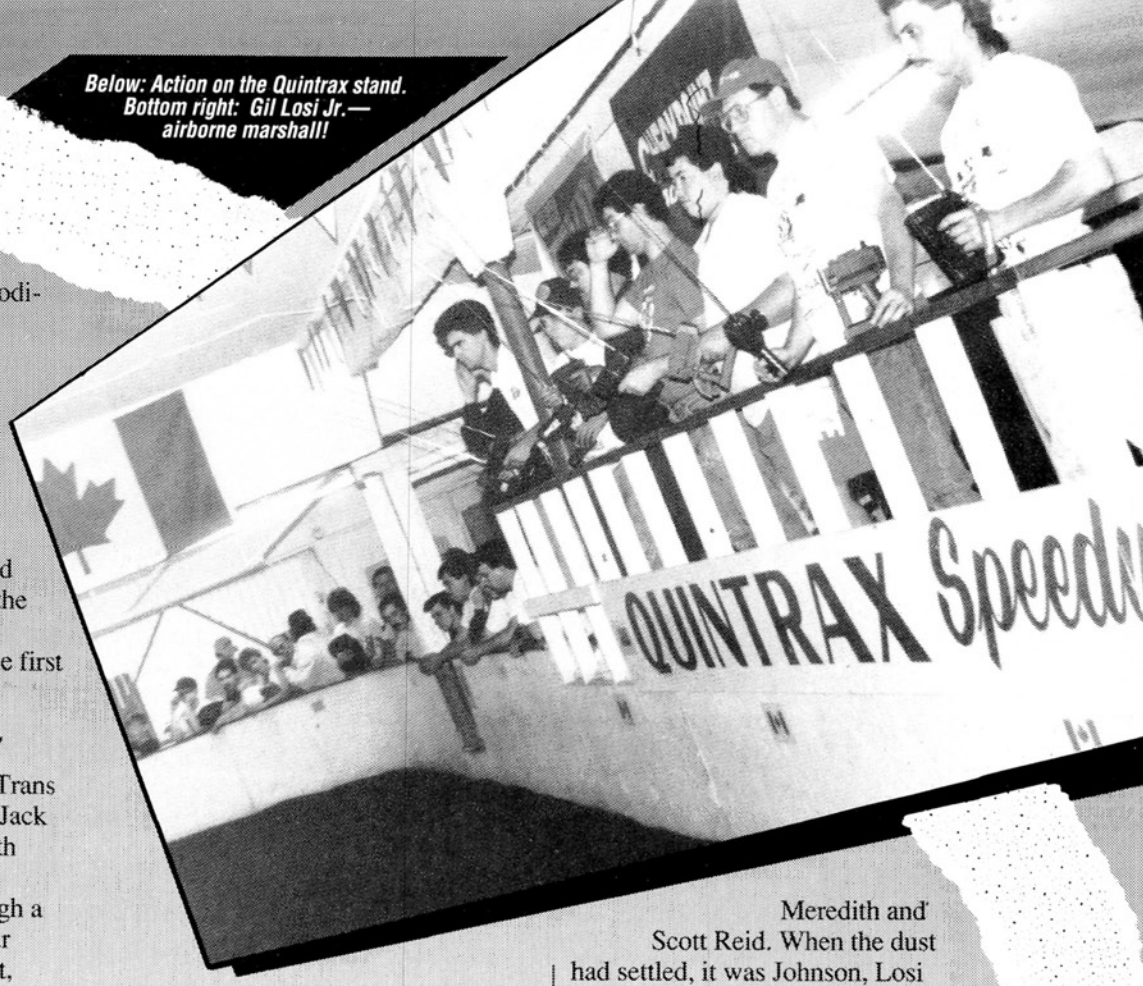
Three key ingredients made this event successful:

- Competent, qualified staff in tech inspection, on the AMB system, in the radio im-pound and transponder area and in Quintrax's well-equipped, on-site, hobby store. Backstage, in the computer room (which was 20 degrees cooler than the rest of the complex!), all the systems were doubled up, the power lines were dedicated and protected, and each heat was manually timed as a back-up.
- The continual (up to 18 hours a day) over-the-speaker presence of Dan Reid, who called all the races and directed traffic, gave the three-day event an upbeat owner's-in-the-store feeling. Dan didn't tolerate any abuse of the marshalls, and he provided excellent, entertaining commentary, whether he was announcing the first

PHOTOS BY MIKE HICKS

These innocent-looking whoop-de-doos were real killers!

Below: Action on the Quintrax stand. Bottom right: Gil Losi Jr.—airborne marshall!



qualifier in the Stock X- or the Modified A-Main.

• A superb, indoor, dirt course with a "wicked" design. Its double set of whoop-de-doos on the infield straightaway meant a lot of thinking and experimentation with shock oils and pistons. The track also featured a 2½-foot tabletop jump just beyond the timing bridge which, if taken the right way, propelled the vehicles down the back straight and into the first turn at ballistic speeds.

TEAM LOSI ON DISPLAY

Brought to the Canadian Nats by Trans Canada Hobbies, Gil Losi Jr. and Jack Johnson were an enormous hit with racers of all ages and skill levels.

Imagine yourself digging through a box of shock pistons, peaking your pack for a heat that's about to start, signing autographs, answering detailed technical questions about a product you designed that's used by 70 to 80 percent of the racers around you, discussing strategy with your teammates, talking to a reporter from *R/C Car Action*...oh yeah, and smiling!

"That's what it's all about," says Jr. "There's no point being aloof or untouchable, and there's a lot to be gained by helping folks out—but there's an enormous amount of pressure, and it tends to take the enjoyment out of the actual racing for me, especially when I'm racing my own product." If Gil hadn't said it, not a soul would have known. He tirelessly looked at car after car, gave tuning tips and listened to stories. He was an attentive corner marshall, and he drove with intensity and style!

CASUAL EXCELLENCE

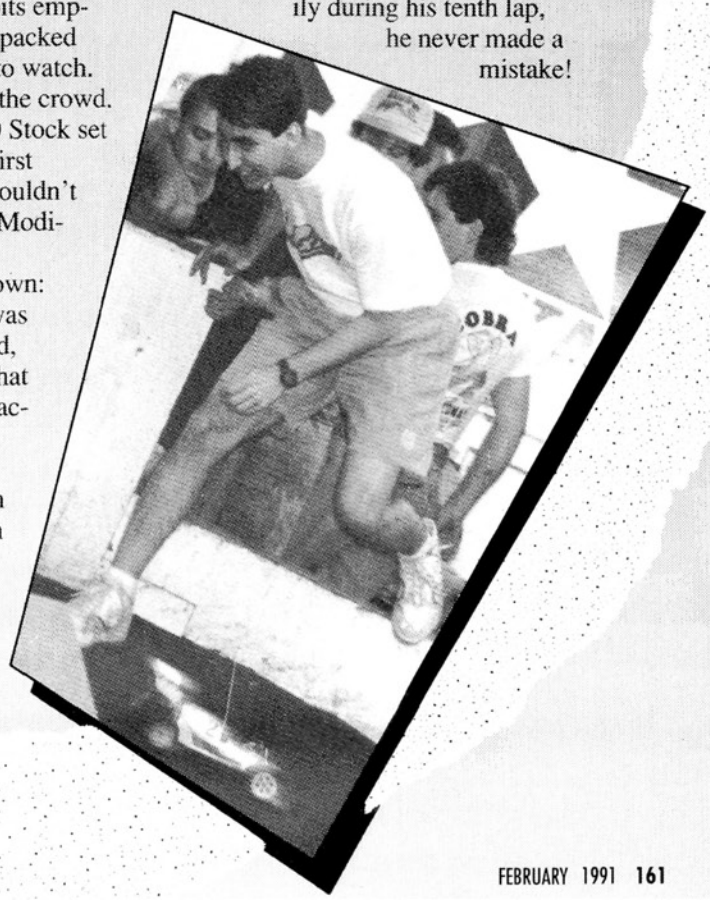
There are enormous differences among the driving styles of the top guns—from the fierce concentration of Andy Dobson and Bill Jeric to the trance-like total relaxation of Jack Johnson.

Because he always appears to be driving so slowly, Johnson is an astonishing driver to watch. Of course, that effortlessness is deceptive. He worked hard to smooth the rough edges and set himself up for each turn and jump to drive the perfect line. Each time he took the drivers' stand, the pits emptied, and at least 200 people packed into every nook and cranny to watch. Johnson never disappointed the crowd. His second qualifier in 2WD Stock set a track record—Quintrax's first 17-lap run—a feat even he couldn't match in either his Stock or Modified 2WD mains!

Here's how it all shook down:

• The 2WD Stock A-Main was the first Main of the weekend, and it gave the crowd just what they were thirsty for: heavy action and Team Losi finesse! Pole sitter Johnson and Losi grabbed 1st and 2nd spots on the first turn, never lost them and set a terrific pace. The real battle was for 3rd, which alternated, moment by moment, between host-club racers Dave Meredith and Scott Reid. When the dust had settled, it was Johnson, Losi and Reid.

• In 2WD Modified A-Main action, Johnson had the pole again and did what he does best: he grabbed a strong, half-lap lead with a blistering 13.5-second first lap and, except for being caught in traffic momentarily during his tenth lap, he never made a mistake!



CANADIAN OFF-ROAD NATS

Team "Lousi" clearly will do anything for publicity—but they have good taste in reading....

Team Bachmann boasts three generations of racers. The group from Waterloo, Ontario, includes Stewart Fowles, Scott Smithers, Maryanne Fowles, Chris Coughlin and Tim Coughlin.

Losi's first lap was a nightmare, because he and the rest of the field created a scale demolition derby. The tangle put him dead last (6 seconds behind Johnson), but he smoothly passed traffic and fended off constant attacks from Boekdrukker, Francois Bergeron and Montrealer Hugues Andre Meloche. Only Johnson and Losi managed to squeeze off a sixteenth lap. Boekdrukker pulled in 3rd, and the audience was ecstatic!

• 4WD Stock boasted an all-Canadian line-up, including such young, up-and-coming drivers as Scott Reid and Robert Ferguson. The only Canadian at the Worlds in Australia last year, Mike Boekdrukker's experience and cool control set the pace as his Pro Radiant peeled off four smooth laps—then, tragedy! Boekdrukker got hung up under the timing bridge, and Brenno Crosara

W I N

2WD STOCK A-MAIN

Fin.	Qual.	Driver	Car	Body	ESC	Motor	Front Tires	Rear Tires	Batteries
1	1	Jack Johnson	JR-X2	JR-X2	Tekin 610	Handout	Losi Stag.	X-pattern	Losi Primetime
2	2	Gil Losi Jr.	JR-X2	JR-X2	N/A	Handout	Losi Stag.	X-pattern	Losi Primetime
3	3	Scott Reid	JR-X2	JR-X2	JEM	Handout	Losi Stag.	X-pattern	Race Prep Nuke 'Em
4	5	Terry Yo	JR-X2	JR-X2	Novak T1	Handout	Losi Stag.	Yok. 2.2	Competition RC Imp.
5	7	John Pepper	JR-X2	JR-X2	JEM	Handout	Trin. 2.2	Trin. 2.2	JLRC Imports
6	4	Dave Meredith	JR-X2	JR-X2	Tekin 600	Handout	Losi Stag.	X-pattern	Shelf Sanyos
7	8	Brian Lavigne	RC10G	Mirage	Tekin 700	Handout	Associated	Losi X-pattern	Trinity Matched SCRs
8	6	Steve Greenly	RC10G	Mirage	Novak T4	Handout	Associated	Losi X-pattern	Race Prep TNT
9	9	Francois Bergeron	JR-X2	JR-X2	Tekin 600	Handout	Losi Stag.	X-pattern	Stage Three

2WD MODIFIED A-MAIN

Fin.	Qual.	Driver	Car	Body	ESC	Motor	Front Tires	Rear Tire	Batteries
1	1	Jack Johnson	JR-X2	JR-X2	Tekin 610	JRS Choice	Losi Stag.	X-pattern	Losi Primetime
2	3	Gil Losi Jr.	JR-X2	JR-X2	N/A	JRS Choice	Losi Stag.	X-pattern	Losi Primetime
3	4	Mike Boekdrukker	JR-X2	Mirage	Tekin 700	Race Prep	Losi Stag.	X-pattern	Race Prep Nuke' Em
4	7	Andre Meloche	JR-X2	JR-X2	Tekin 600	Reedy	Losi Stag.	X-pattern	Reedy Pinkpak
5	2	Scott Reid	JR-X2	JR-X2	JEM	Race Prep	Yok. 2.2	Yok. 2.2	Competition RC Imp
6	9	Francois Bergeron	JR-X2	JR-X2	Tekin 600	Speedworks	Losi Stag.	X-pattern	Gonzo
7	5	Glen Tonogai	JR-X2	JR-X2	Novak T1	Twister	Losi Stag.	X-pattern	Team Smooth
8	6	John Pepper	JR-X2	JR-X2	JEM	JRX Choice	Trin. 2.2	Trin. 2.2	Race Prep Nuke 'Em
9	8	Dave Meredith	JR-X2	JR-X2	Tekin 600	Checkpoint	Losi Stag.	X-pattern	Shelf Sanyos

4WD STOCK A-MAIN

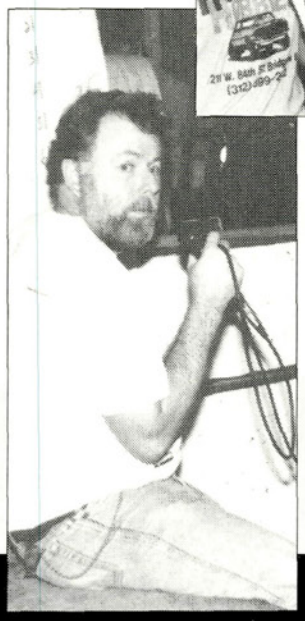
Fin.	Qual.	Driver	Car	Body	ESC	Motor	Front Tires	Rear Tires	Batteries
1	5	Brenno Crosara	YZ-10	YZ-10	Tekin 600	Handout	Trin. 2.2	Trin. 2.2	N/A
2	2	Mike Boekdrukker	Lazer	Lazer	Tekin 600	Handout	Losi 4 Row	Losi X-pattern	Race Prep Nuke 'Em
3	3	Dave Henry	Lazer	Lazer	Tekin 700	Handout	Yok. 2.2	Yok. 2.2	Kyosho Matched
4	4	Scott Reid	YZ-10	Warrior	JEM	Handout	Yok. 2.2	Yok. 2.2	JLRC Imports
5	9	Rob Ferguson	YZ-10	Warrior	Novak 2	Handout	Trin. 2.2	Losi X-pattern	Trinity Pushed SCR
6	1	Dave Meredith	Lazer	Lazer	Novak 1	Handout	Yok. 2.2	Yok. 2.2	Shelf Sanyos
7	6	Steve Peake	YZ-10	YZ-10	Novak T1X	Handout	Trin. 2.2	Trin. 2.2	Shelf Sanyos
8	8	John Pepper	Cust. Mid	Cust. Mid	JEM	Handout	Yok. 2.2	Trin. 2.2	Race Prep Nuke 'Em
9	7	Paul Miller	Pro Cat	Shum.	Tekin 600	Handout	Trin. 2.2	Trin. 2.2	Bachmann

stole the lead from him. This 4-minute "battle royale" came to an incredible climax with Crosara 1st, Boekdrukker 2nd and Dave Henry 3rd—fewer than 3 1/2 seconds separated them!

• In the 4WD Modified A-Main, Losi grabbed an early lead, weaving his way through traffic and setting up a "freight train" with Johnson behind and Montreal's Paul Miller on Johnson's tail. At the 1-minute mark, Boekdrukker's Pro Radiant stole the 3rd position from Miller, and a real dogfight began for the 2nd and 3rd spots between Dave Meredith, Boedrukker, Johnson and Miller. At the halfway point, Losi was tagged by another car, and Johnson squirted through to take the lead by almost a full lap! Losi had more trouble with traffic and, when the dust had settled, local driver Meredith was in 2nd place followed by Boekdrukker.

It was an exciting, smooth weekend of racing. We suspect that Team Losi's venture northward is just the beginning and, as word reaches the other factory teams, we'll see more of our American friends here in the great white north. ■

Gil Losi and Jack Johnson share the finer points of corn chips with a Canadian racer. (Note Quintrax's well-stocked hobby shop in the background.)



Quintrax owner Dan Reid is calm, cool, and—after three days—hoarse!

RESULTS

4WD MODIFIED A-MAIN

Fin.	Qual.	Driver	Car	Body	ESC	Motor	Front Tires	Rear Tires	Batteries
1	1	Jack Johnson	Lazer	Lazer	Tekin 620	Wetmag 4	Losi	Losi	Losi Primetime
2	2	Dave Meredith	Lazer	Lazer	Novak T1	Race Prep	Trin. 2.2	Yok. 2.2	Shelf Sanyos
3	6	Mike Boekdrukker	Pro Radiant	Boost	Tekin 700	Race Prep	Yok. 1.5	Losi X-pattern	Race Prep Nuke 'Em
4	3	Gil Losi Jr.	Lazer	Lazer	Novak T1	Motown Missile	Losi	Losi	Losi Primetime
5	4	Scott Reid	YZ-10	Warrior	JEM	Race Prep	Trin. 2.2	Trin. 2.2	JLRC Imports
6	7	Terry Yo	YZ-10	Yokomo	Novak T1X	Yokomo	Yok. TR31	Yok. TR31	Competition RC Imp.
7	8	John Pepper	Cust. Mid	Kyosho	JEM	JRS Choice	Yok. 2.2	Trin. 2.2	Race Prep Nuke 'Em
8	9	Paul Miller	Pro Cat	Shum.	Tekin 600	Twister Blackmax	Trin. 2.2	Trin. 2.2	Bachmann
9	5	Al Walker	Lazer	Lazer	Tekin 700	Race Ace Phantom	Yok. 2.2	Trin. 2.2	Shelf Sanyo

2WD STOCK TRUCK A-MAIN

Fin.	Qual.	Driver	Car	Body	ESC	Motor	Front Tires	Rear Tires	Batteries
1	1	Scott Reid	JR-XT	JR-XT	JEM	Handout	JR-XT Nats	JR-XT Nats	Race Prep Nuke 'Em
2	4	John Pepper	JR-XT	JR-XT	JEM	Handout	JR-XT Nats	JR-XT Nats	Race Prep Nuke 'Em
3	2	Dave Meredith	JR-XT	JR-XT	Tekin 600	Handout	JR-XT Nats	JR-XT Nats	Shelf Sanyos
4	7	Jack McGovern	JR-XT	JR-XT	Tekin 600	Handout	IMEX	JR-XT Nats	Bachmann
5	8	Shawn Serson	JR-XT	JR-XT	Novak T1X	Handout	JR-XT Nats	JR-XT Nats	Shelf Sanyos
6	3	Tony Houghton	JR-XT	JR-XT	Novak T1X	Handout	JR-XT Nats	JR-XT Nats	Losi Primetime
7	5	Scot Preston	JR-XT	JR-XT	N/A	Handout	JR-XT Nats	JR-XT Nats	N/A
8	6	Graydon Palmer	JR-XT	JR-XT	Tekin 610	Handout	JR-XT Nats	JR-XT Nats	JLRC Imports

MODIFIED TRUCK A-MAIN

Fin.	Qual.	Driver	Car	Body	ESC	Motor	Front Tires	Rear Tires	Batteries
1	2	Scott Reid	JR-XT	JR-XT	JEM	Kyosho Mega	JR-XT Nats	JR-XT Nats	JLRC Imports
2	3	John Pepper	JR-XT	JR-XT	JEM	JRX Choice	JR-XT Nats	JR-XT Nats	Race Prep Nuke 'Em
3	4	Michael Mercado	JR-XT	JR-XT	Futaba 116	Losi MTM	JR-XT Nats	JR-XT Nats	N/A
4	8	Russ McPeak	JR-XT	JR-XT	JEM	Speedworks Joel	JR-XT Nats	JR-XT Nats	JLRC Imports
5	6	Kevin Mallen	No Info						
6	8	Rod Conley	JR-XT	JR-XT	JEM	Race Prep	JR-XT Nats	JR-XT Nats	JLRC Imports
7	1	Dave Meredith	JR-XT	JR-XT	Tekin 600	Checkpoint	JR-XT Nats	JR-XT Nats	Shelf Sanyos
8	5	Tony Houghton	JR-XT	JR-XT	Novak T1X	N/A	JR-XT Nats	JR-XT Nats	Losi Primetime

RC10LTO

(Continued from page 159)

fast; in fact, I'm looking forward to tearing up the track with my 10LTO!

**Here are the addresses of the companies mentioned in this article:*
Bolink R/C Cars, *420 Hosea Rd., Lawrenceville, GA 30245.*
CompositeCraft, Inc., *5885 Lake Hurst Dr., Orlando, FL 32819.*
Associated Electrics, Inc., *3585 Cadillac Ave., Costa Mesa, CA 92626.*
Hobby Products International (HPI), *22600-C Lambert, Ste. 904, El Toro, CA 92630.*
T&A Precision Wheels, *2524 E. Fender, Ste. D, Fullerton, CA 92631.*
Magic Motorsports; a division of Trinity. Team Losi, *1655 E. Mission Blvd., Pomona, CA 91766.*
MIP, *838 Edna Pl., Covina, CA 91723.*
SCI/USA, *P.O. Box 13099, Sarasota, FL 34278.*
Reedy Co., *3585 Cadillac Ave., Costa Mesa, CA 92626.*
Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.*
TRC, *P.O. Box 1058, 2211 Charter St., Albemarle, NC 28002.*
Trinity, *1901 E. Linden Ave, #8, Linden, NJ 07036.* ■

FERRARI F189

(Continued from page 52)

it's the only compound available from Tamiya.

With a typical, off-the-shelf (unmatched) battery pack, the car averages 4- to 5-minute runs at decent speeds. You can change the gear ratio to increase run times, but the gears are metric pitch, so you'll need a metric pinion.

I have to say that the Tamiya F-189 isn't for experienced racers. Because of its plastic components, the car doesn't have the rigidity of a high-performance vehicle. Ultrafine tuning isn't possible with this car. To make the F-189 competitive, you'd have to modify it extensively and this would put you in the price range of the super cars.

The F-189 is suitable for novice R/C drivers who know how to tune and con-

(Continued on page 167)

FERRARI F189

(Continued from page 164)

trol a faster R/C car. It has enough adjustments to get its handling into a respectable range, but not so much that it can be dialed-in right off the track. The car's price is competitive with those of the less expensive, race-built pan cars; it's much easier to assemble; and it's fun to drive.

Entry-level groups who are interested in trying on-road cars should also look at the F-189. It has great lines (tremendous scale appearance), and the instructions are good for first-time builders. For an open-wheel car, the finished model is very rugged, and it should keep running even after a hard collision.

Overall, I was happy with the car's performance. It's not the right choice for running in racing circles, but its respectable performance, durability and sharp looks are on its side!

**Here are the addresses of the companies mentioned in this article:*
MRC/Tamiya, *200 Carter Dr., P.O. Box 267, Edison, NJ 08818.*
Team Losi, *1655 E. Mission Blvd., Pomona, CA 91766.*
Kyosho; *distributed by Great Planes Model Dist., P.O. Box 4102, Champaign, IL 61820.*
Pactra Plasti-Kote Co., *1000 Lake Rd., Medina, OH 44256.*
Testor Corp., *620 Buckbee St., Rockford, IL 61101.* ■

KALT WHISPER

(Continued from page 113)

of light training gear under it to help prevent tip-overs. Its biggest weakness as a trainer is its fragility, which is a byproduct of Kalt's desire to reduce its weight. The Whisper might not stand up to the abuses of flight training too well.

FINAL NOTES

Be sure to read the section in the manual on battery care. Your battery pack should be completely discharged and cooled after each use. I opted for the Astro Flight* model 115 AC/DC Variable-Rate Charger, which allows both quick- and trickle charging, as well as discharging or cycling. This unit can use a 110V household current or a 12V auto battery as a power source. The model 115 meets all the needs of Ni-Cd battery care, and it worked perfectly during my tests.

Kalt plans to offer its own fast-charger for the Whisper as well as an autorotation clutch and a high-performance motor. These items will make the Whisper even more fun!

OK rug rats! Think you can become a rad rotator?

**Here are the addresses of the companies mentioned in this article:*
Kalt; *distributed by Hobby Dynamics, 4105 Fieldstone, Champaign, IL 61821.*
Loctite Corp., *4450 Cranwood Ct., Cleveland, OH 44128.*
JR ; *distributed by Hobby Dynamics.*
Astro Flight Inc., *13311 Beach Ave., Marina Del Rey, CA 90292.* ■

CUSTOM GRAPHICS

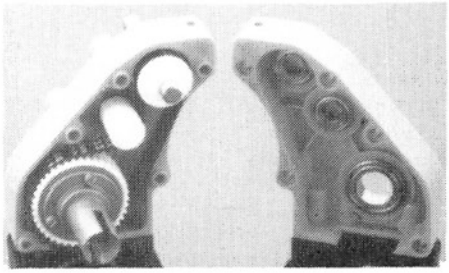
(Continued from page 117)

on one, 48-inch roll. (It's the same as the vinyl that's used for the decals, so it's flexible and available in many colors.) When the lines were on the body, I scored them with a knife from the inside; then I removed the mask and started to paint. When you've finished painting, you can either leave the lines on the body or remove them. I left them, and also used the tape to outline the doors and windows.

Usually, I paint the body before I apply the graphics. For this project, I knew where to put the graphics, but I had to *see* them in place to visualize the paint scheme. When applying the graphics, it's a good idea to first position them with the backing in place. To make alignment easy and to ensure proper positioning, use a

(Continued on page 190)

WHAT'S NEW



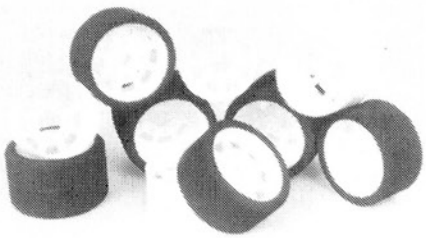
A&L
Lethal Weapon

A&L's Lethal Weapon is a premium-quality, belt-drive transmission that uses the most efficient belt available in any 2WD tranny. This gives it the lowest drag under power possible (with zero gear lash), which results in longer running time and faster acceleration. All this—and it needs only half as much maintenance as gear- or chain-drive trannies! The Lethal Weapon diff was manufactured by MIP to incorporate a total of 35 balls with replaceable, locking, diff rings to keep the rebuilding cost low.

Price: $134.95; $139.95; $139.95.

Part nos. 200 (RC10); 201 (Kyosho Ultima); 208 (Tamiya Astute).

For more information, contact A&L Mfg., 1490 W. Rincon #J, Corona, CA 91720.



BOLINK
Genuine Black Dot Tires

Tired of the imitations? Get real with Bolink's genuine Black Dot Rubber Tires! Pre-mounted on Bolink stock-car wheels, these tires are superlight, so they won't slow you down, and they're durable. Choose black or white wheels to suit your style. The rear tires come in 1 1/2- or 2-inch widths.

For more information, contact Bolink R/C Cars, Inc., 420 Hosea Rd., Lawrenceville, GA 30245.

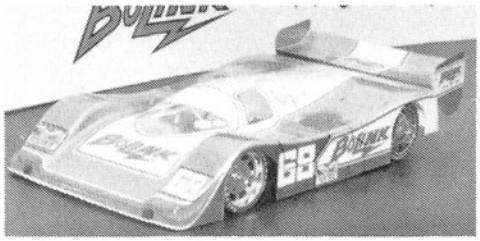
'91 Chevy S-10 Blazer

"Today's Chevrolet" S-10 Blazer is made for your monster truck. Every detail of the full-size truck is accurately reproduced on this model Chevy body. Be the first to show off this 1991 version of a great-looking, go-anywhere Blazer.

Price: $18

Part no. BL-2333

For more information, contact Bolink R/C Cars, Inc., 420 Hosea Rd., Lawrenceville, GA 30245.



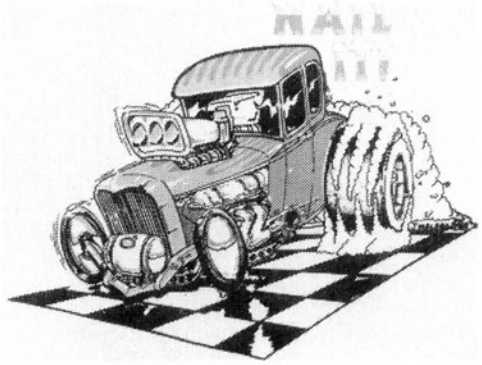
Porsche 962 GTP

Owing to the popularity of its predecessors, Bolink has released the Porsche 962 GTP "short" version in 1/10 and 1/12 scale. Driven in last year's GTP World Challenge in Tampa, FL, this "short" Porsche has proven that good things come in small packages. Bolink's wind-tunnel testing assures you of aerodynamic styling.

Price: $18; $11.

Part no. BL-2 332-L (1/10); BL-2020 (1/12).

For more information, contact Bolink R/C Cars, Inc., 420 Hosea Rd., Lawrenceville, GA 30245.



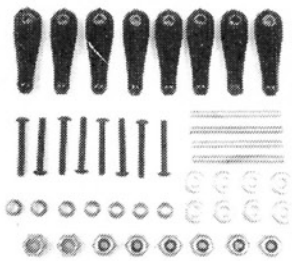
CARTOONS INK
Custom Art On High-Quality T-Shirts

Cartoons Ink offers "Art" by Jim Malaro, who excels in automotive art, cartooning and illustration. All the printing is done on Hanes premium 50/50, or 100-percent cotton Beefy T-shirts, sweats, tanks and crop-tops, in Youth, XS, S, M and L sizes.

The pictured design is available as a white T-shirt, or as a 100-percent cotton women's crop-top in peach, aqua, or white (one size fits all). Write for a catalogue, or call for free consultation.

Price: T-Shirts: Adult, $11.95; Youth, $9.95; Sweats: Adult, $16.95; Youth $14.95. Add $2 S&H per shirt (overseas, add $4, U.S. funds only).

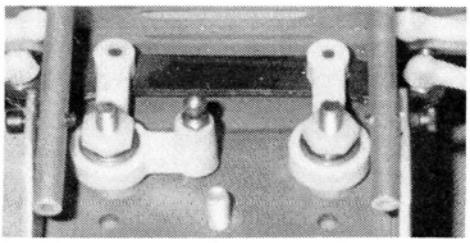
For more information, contact Cartoons Ink, 330 W. Mountain Rd., Sparta, NJ 07871; Tel.: (201) 729-8984; FAX: (201) 729-8236.



TRACK MASTER
HD Linkage

Sporting super-tough, light, Heim-joint ends, these new suspension- and steering- linkage kits are a must for added reliability, and they're available for most popular cars.

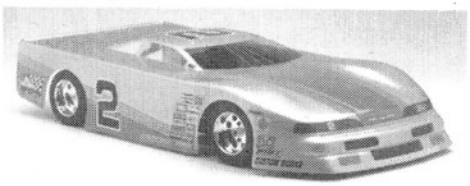
For more information, contact Track Master, 1466 Pioneer Way #10, El Cajon, CA 92020.



A&L
Steering Bellcranks

A&L now makes precise steering possible for the RC10, the Ultima, the Optima, the JR-X2 and the YZ-10. Using A&L's Bellcrank kits enables you to dial-in the least amount of bump-steer possible, and it provides more positive steering and less play. It has a left and right arm plus an idler arm, so you can choose where to mount the servo. It uses 1/4x3/8 flanged or non-flanged bearings (available separately), and it has a rack bar, which gives the car more Ackerman steering. These kits are especially good for monster trucks, which need heavy-duty steering components.

For more information, contact A&L Mfg., 1490 W. Rincon #J, Corona, CA 91720.



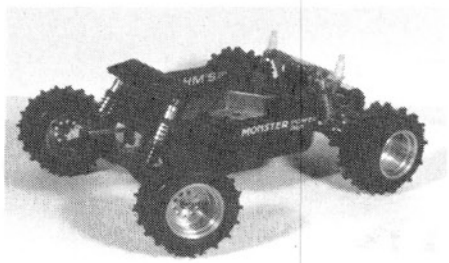
CUSTOM WORKS
Pro-Mod Thunderbird Body

Custom Works introduces the Pro-Mod Thunderbird Body. Its performance equals that of the Pro-Mod Lumina Body (no. 9005). Professionally tested under race conditions, the Pro-Mod Thunderbird gives your R/C car smoother, more stable handling.

Price: $20

Part no. 9006

For more information, contact Custom Works, 3720 Easton Dr. #7, Bakersfield, CA 93309.



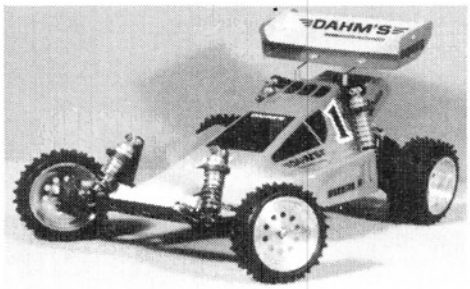
DAHM'S
Monster Power Pan

Dahm's new Lexan Monster Power Pan (underbody) is designed to fit all monster trucks with flat-bottom frames. It helps to keep out dirt and moisture and makes your monster truck more aerodynamic. The Monster Power Pan includes a Lexan supercharger with a scoop, instructions and decals.

Price: $10.98

Part no. D126

For more information, contact Dahm's Racing Bodies, P.O. Box 360, Cotati, CA 94931.



Warrior II

Dahm's new, super-aerodynamic, Warrior II off-road racing body is designed for the RC10 graphite, the TQ10 and most other 1/10-scale off-road cars. Here, the Warrior II is shown with Dahm's Warrior II Power Pan (underbody), 6-inch FX Wing and Turbo Cooler (heat sink). It comes with finishing instructions, decals and a sample of Dahm's graphic film.

Price: $17.98; $29.98 (painted); $10.98 (Warrior II Power Pan).

Part nos. D170; D170P; D175.

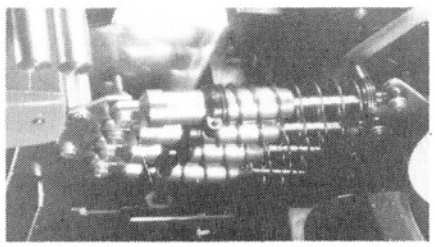
Thriller

Dahm's new 1990 Custom Nissan Pathfinder body—the Thriller—fits most 1/10-scale cars. Here, the Thriller is shown on an RC10 monster-truck conversion with Dahm's Monster Power Pan (Lexan underbody). Because it's made of .040 GE Lexan, the Thriller is stronger than most truck bodies. It features custom, aerodynamic styling, a narrow racing profile, sunroof, wide wheel flares and fine detailing. The Thriller body comes with finishing instructions, decals and a sample of Dahm's graphic film.

Price: $19.98

Part no. D191

For more information, contact Dahm's Racing Bodies, P.O. Box 360, Cotati, CA 94931.



ESP
King Clod Quad Shock Mounts

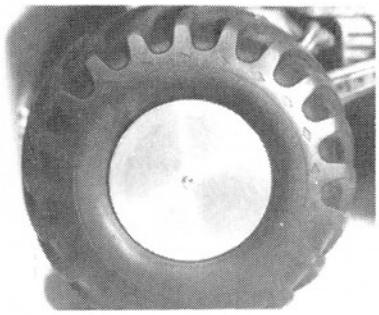
The ultimate in heavy-duty suspension systems, this kit uses a total of 16 oil shocks! It includes four upper and four lower shock mounts and all the necessary mounting hardware.

Price: $21.95

Part no. ESP021

For more information, contact ESP Mfg., 524 Woodland Dr., Crystal Lake, IL 60014.

WHAT'S NEW



ESP
Clod Buster
Aluminum Wheel Discs

ESP is proud to introduce its new, highly polished, aluminum wheel discs for the Clod Buster. These direct-bolt-on discs make high styling and wheel protection affordable.

Price: $29.95

Part no. ESP005

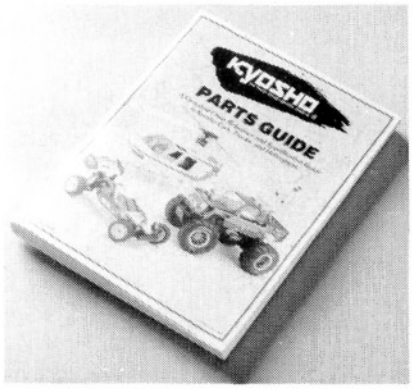
For more information, contact ESP Mfg., 524 Woodland Dr., Crystal Lake, IL 60014.

KYOSHO
Ferrari Testarossa

Kyosho announces its 1/10-scale, electric Ferrari Testarossa. This highly detailed 2WD model features a fully adjustable suspension, aluminum shock towers and oil-filled, coil-over shocks. The included speed controller has three forward and one reverse speeds. Based on the Kyosho Ultima II chassis, the Ferrari Testarossa accepts all the Ultima hop-up parts.

Price: $199.95

For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61824.



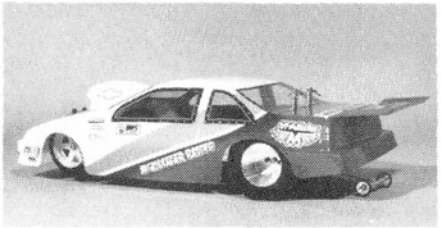
GREAT PLANES
Kyosho's Parts
Reference Guide

Kyosho announces a complete guide to its car, truck and helicopter parts. The 315-page, cross-referenced manual covers parts for more than 60 Kyosho products, and it's a comprehensive guide for referencing and re-ordering parts. Included are product photos and part numbers and an optional hop-up parts section. The loose-leaf manual is three-hole punched for easy updating.

Price: $9.95

Part no. KYOZ2025

For more information, contact Great Planes Model Distributors., P.O. Box 4021, Champaign, IL 61824.

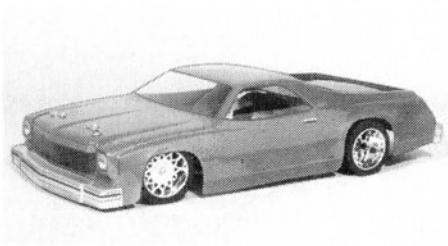


McALLISTER RACING
The Baretta

Blast off the line with the ultimate pro-stock body—the Baretta. It's 8 inches wide and perfect for new-wave drag chassis. It comes with a molded-in aero scoop and a separate wing.

Part no. B-143

For more information, contact McAllister Racing, 2245 First St., Unit 105, Simi Valley, CA 93065.



McALLISTER RACING
Classic Hauler

At last, an El Camino body for your R/C car! It's perfect for cruisin' the neighborhood, or hauling your racer into the concours judging.

Part no. B-142

For more information, contact McAllister Racing, 2245 First St., Unit 105, Simi Valley, CA 93065.

SYNCO CHEMICAL
Super Lube with Teflon

Super Lube—the patented, non-toxic, multipurpose lubricant with Teflon®—is now available in an aerosol can as a sprayable grease; in tubes, cartridges, jars, pails and drums as a white grease; and in a precision applicator as a liquid.

Super Lube was created because of the demand for a highly efficient, environmentally safe lubricant. It provides safe indoor/outdoor lubrication and surface protection in temperatures ranging from minus 45 degrees to plus 450 degrees (F), and it won't stain or chemically affect fabric, rubber, plastic, paint, or wood.

For more information, contact Synco Chemical Corp., P.O. Box 405, Bohemia, NY 11716.

CUSTOM GRAPHICS

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china marker and mark the body at the edges of the decal.

The next time you have a really cool idea for a car, don't drive yourself crazy by trying to calculate and cut out designs yourself. Get in touch with Custom R/C Graphix, and get the job done properly. From a complex multicolored layout to your own team logo, they've got what it takes to make your car stand out.

**Here's the address of the company featured in this article:*
***Custom R/C Graphix,** 4138 Boston Rd., Bronx, NY 10475.* ■

SECOND-LOOK SERIES

(Continued from page 149)

Following advice from Team Associated's Kent Clausen, to avoid "hopping," I used some Bud's silicone lube on the dampener plates of the rear suspension. I noticed that although many cars were occasionally thrown off by bumps, my slightly higher setup was very stable. CKW* rubber-cap tires did the trick for traction, and they lasted.

The third, and most frustrating phase, of the test took place at Megatrack in Browns Mills, NJ. I was absolutely "ballistic" on this high-banked concrete tri-oval. Unfortunately, I broke two T-bars in my qualifiers. I think that I may have overtightened the screws that hold the T-bar to the rear pod; this could have caused the failures. Still, I was able to make and lead the C-Main at the New Jersey Concrete Oval Championships. My two-lap lead vanished in one, sickening moment, however, as the graphite axle sheared off at the wheel. I've been told that other 10L owners have also suffered broken axles.

The RC10L is a great car. It handled perfectly, right off the work table. I was able to put it anywhere on the track and still hold a good line. It held up during many weeks of racing at my home track and also to the high speeds of the Thunderdrome. I hope that the car's problems were the result of a tough track, but only time will tell. A titanium axle may be the answer.

I know that this car will get you to the winners' circle, so give it a try.

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SECOND-LOOK SERIES

(Continued from page 190)

**Here are the address of the companies mentioned in this article:*

Associated Electrics, Inc., *3585 Cadillac Ave., Costa Mesa, CA 92626.*

Dremel, *4915 21st St., Racine, WI 53406.*

Bolink R/C Cars, Inc., *420 Hosea Rd., Lawrenceville, GA 30245.*

Litespeed, *P.O. Box 4765, Spokane, WA 99202.*

JG Manufacturing, *P.O. Box 6014, Whittier, CA 90609.*

Bud's Racing Products, *52435 Rte. 113, Wakeman, OH 44889.*

Hyperdrive Racing Systems, *3210 Howard Nickell Rd., Fayetteville, AR 72703.*

Robinson Racing Products, *165 N. Malena Dr., Orange, CA 92669.*

Cheetah Racing, *10823 Amestoy Ave., Granada Hills, CA 91344.*

Scale Racing Products, *6900 Chadbourne Dr., North Olmstead, OH 44070.*

Kimbrough Products, *1430 East St., Andrews Place/Unit F, Santa Ana, CA 92705.*

Reedy; *distributed by Associated Electrics (see above).*

SassyChassis, *204 South Oak St., Itasca, IL 60143.*

Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.*

Novak Electronics, Inc., *128-C E. Dyer Rd., Santa Ana, CA 92707.*

CKW Manufacturing, *1889 Commonwealth, Unit 1, Fullerton, CA 92633.* ■

MIP'S 4WD RC10

(Continued from page 156)

• Second Qualifier: This time, I used a different motor, guessed at the gearing, and I made it through most of the traffic in the first turn. It was a seesaw battle for 1st place between my 4/10 and two other

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MIP'S 4WD RC10

(Continued from page 198)

cars. One minute into the race, and one of the other lead cars went up and over the berm in the second hairpin. That smile just kept coming back: "I like it!" You don't have to fight with this car to make it go where you want it to go. This time, my car didn't fade away at the halfway point! The lead car went wide on the sweeper, while my 4/10 dove to the inside to take the lead. I took 1st place in the first heat of the 2nd qualifier.

• A-Main action: Out of 12 cars, my car qualified 3rd—with a T4 speed controller, no less. The top qualifier of the day (the clubs' points leader, Joe) screamed into the first turn, with me right on his tail. I avoided the first-turn turmoil and went through the sweeper and over the first jump. Oh, no! Joe's car threw a dogbone and stopped dead in its tracks. Our cars were so close that my car might as well have thrown one, too!

As the other cars passed us, the turn marshal scrambled to the scene. He picked up Joe's car and, in the heat of excitement,

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MIP'S 4WD RC10

(Continued from page 210)

he overturned my car! Then, realizing what had happened, he righted it. I was now down by three-quarters of a lap, but as the race progressed, I could see that I was gaining ground with every lap. Thirty seconds to go: the lead car was less than a quarter lap ahead. With my 4/10 right on its fender, the 3rd-place car went wildly out of control in the second hairpin. I went on to take 3rd in the A-Main—not too shabby for a car that wasn't even test-driven before race day.

There's more to come! Look for Part II in the next issue of Car Action.

**Here are the addresses of the companies mentioned in this article:*

***Associated Electrics, Inc.,** 3585 Cadillac Ave., Costa Mesa, CA 92626.*

***MIP (Moore's Ideal Products),** 838 E. Edna Place, Covina, CA 91723.*

***Houge Enterprises,** 2400 Sandlake Rd., Orlando, FL 32809.*

***Team Losi,** 1655 E. Mission Blvd., Pomona, CA 91766.*

***Novak Electronics, Inc.,** 128-C East Dyer Rd., Santa Ana, CA 92707.*

***KO Propo;** distributed by Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728.* ■

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